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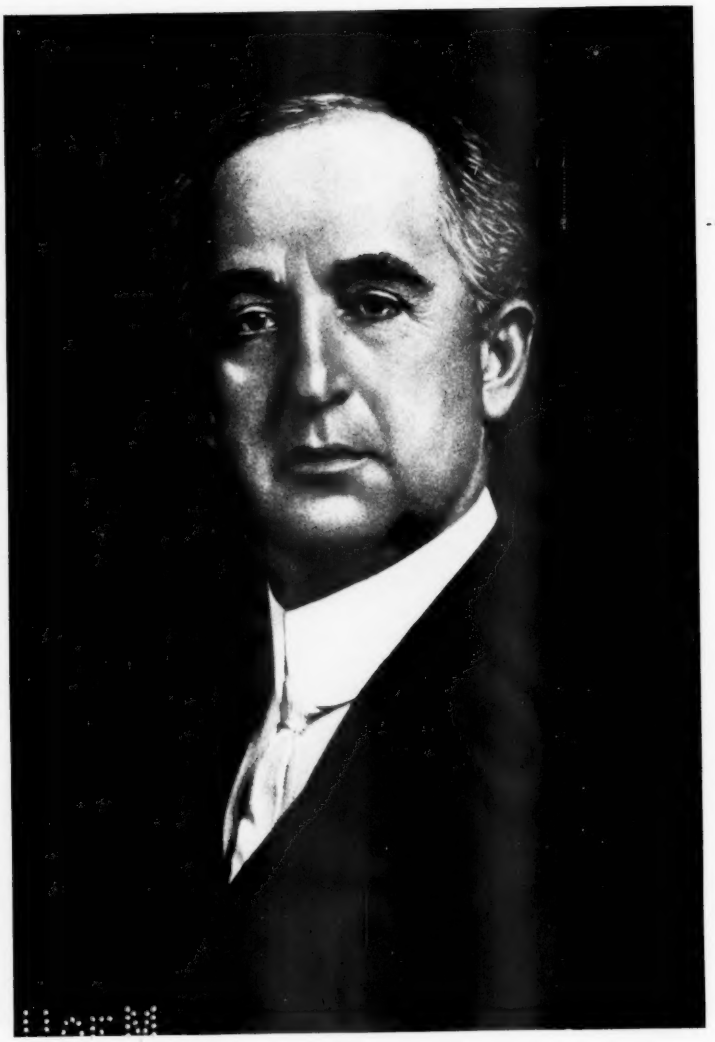

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President American Gynecological Society

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DIAGNOSIS AND TREATMENT OF "CONTRACTED PELVES"[1]

BY J. M. MUNRO KERR, M. D., GLASGOW, SCOTLAND

Professor of Midwifery and Diseases of Women, Anderson's College Medical School; Obstetric Surgeon, Maternity and Women's Hospital; Gynæcological Surgeon, Western Infirmary, Glasgow; etc.

MR. PRESIDENT and Fellows of the American Gynecological Society: I deeply appreciate the very high honour you have conferred upon me in asking me to deliver an address to your Association and I most cordially thank you. Although I have never been in your country before, I feel almost as if I were amongst friends because so many of your names are familiar to me from the literature of obstetrics and gynæcology. Some of you I have met and with a number I have corresponded and I am particularly grieved to find that amongst those with whom I have corresponded and whom I had hoped to meet to-day, is one who is no longer with us: I refer to Professor Jewett of the Long Island College Hospital, New York. His "Practice of Obstetrics" in particular was well known and highly esteemed by British obstetricians.

But while deeply grateful for the honour, I feel particularly diffident in appearing before you as I find the names of so many distinguished workers in our particular branch of medicine who have addressed you formerly. I am sure, however, that the kindness which has prompted you to invite me here will also characterize your criticism of my paper. It it no easy task, even for the boldest, to deliver an address of this nature. But you have made matters as easy as you could for me by suggesting the subject of "Contracted Pelves." You could not have chosen one more interesting to me, as it has been my good fortune to have had a very considerable experience with "contracted pelves" in the years I have been connected with Glasgow Maternity Hospital.

As you are perhaps aware, rickets is particularly prevalent in the city of Glasgow and in consequence we have an enormous number of cases of contracted pelves. Every third woman admitted to the hospital has pelvic deformity and we actually had some years ago three cases of Cæsarean section in twenty-four hours.

In this address I propose to give simply my own views on the diagnosis and treatment of contracted pelves. I shall make no attempt to indicate in what manner I agree or differ with other authorities, for if I began to do so there would be no end to this paper. You will forgive me, therefore, if I appear dogmatic and believe me when I say that although I hold the views I am about to express I do not for a moment believe that other opinions and other procedures are not equally sound, nor do I forget that we are the heirs and beneficiaries of the workers of past ages.

I intend to consider, first of all, and that very briefly, the "Diagnosis of Contracted Pelvis" and then to discuss its treatment in as much detail as time will permit.

[1] An Address delivered before the American Gynecological Society at its Annual Meeting, May 23–25, 1911

DIAGNOSIS OF CONTRACTED PELVIS

The diagnosis of contracted pelvis is not difficult and the greater the deformity the easier the diagnosis. But while it is not difficult to recognize a deformity of the pelvis it is by no means easy to appreciate the exact degree of the malformation. The reason of this is that the means at our disposal for estimating the pelvic capacity in the living subject are defective. Neither by our hands nor by pelvimeters can we accurately measure the pelvis. Every one here, I feel sure, will agree with me that the taking the oblique conjugate, or the introducing the whole hand into the vagina and estimating the size of the brim by the number of fingers that can be passed between promontory and symphysis pubis, although useful enough in giving a general impression of the pelvic capacity, does not permit of an accurate pelvic mensuration. By neither of them, no matter how much care is taken, can a measurement exact to within .5 cm. be arrived at. This I say without the slightest fear of contradiction, for I have seen measurements most carefully made on the living subject wrong by .5 to 1. cm. in unfortunate cases where the patients died and their pelves were examined postmortem. The results with pelvimeters are but little better. Even the best one, Skutsch's, cannot be trusted to give results much better than the hands.

But even although we could measure the pelvis exactly we are met by a second difficulty, the variability of the child's head as regards size and consistency. Now if it is difficult to measure the maternal pelvis correctly, it is much more difficult to measure the fœtal head *in utero*. After a great deal of practice in palpation a fairly good idea can be formed as to whether the child's head is large or small, but one cannot possibly obtain accurate measurement of the fœtal head with cephalometers and certainly no exact estimate of its consistency. We are, therefore, forced to admit that we cannot accurately measure the canal nor the body that has to pass through that canal. Fortunately, this is of no great consequence for we have now a method of examination that is absolutely satisfactory from the practical point of view.

What really concerns us in practice in a particular case is the relative size of maternal pelvis and fœtal head, and what we should always ask ourselves is, how does the fœtal head fit the maternal pelvis?

In recent years this has been attained, and we are now able to gauge with great exactness the relative size of the maternal pelvis and fœtal head. We are now able to fully appreciate these words of Barbour which should be written over every labour couch:

"The fœtal head is the best pelvimeter."

In my own clinic I have obtained the best results by employing the method here illustrated. It is a bimanual method and requires no assistant to press down the head into the pelvis. The accoucheur takes the Pawlick grip of the fœtal head with his right hand and presses the head into the pelvis, while with the two fingers of the left introduced into the vagina he feels how the head engages. At the same time with the thumb he feels all along the brim and estimates the degree of overlapping. I attach great importance to the examination with the thumb and in that respect chiefly my method differs from Müller's. I can now estimate with great accuracy whether or not a head will pass the brim spontaneously and also the degree of traction, etc., that is likely to be required should forceps be necessary. Many ask is this estimation of the relative size of head and

pelvis a matter of difficulty? Certainly it is a little difficult at first but one soon acquires sufficient proficiency with practice. I am now in the position of stating to my assistants and students, "This head will come through, I believe, spontaneously"; "this one will require a little help with forceps." So I very seldom require to perform pubiotomy. I shall consider that matter later.

There are two objections to the proceeding. The one is that to carry it out satisfactorily an anæsthetic is necessary, and the other that in not a few cases the presentation is not cranial, but breech. But even admitting the necessity of an anæsthetic, surely that is a small disadvantage compared to the valuable information obtained. The other objection, that the method is not available in breech cases, is after all, not of great consequence because such presentation is infrequent and besides it is often possible to perform external cephalic version. I have repeatedly carried out this maneuver and generally with very little difficulty if the pregnancy has not extended beyond the thirty-sixth week. At full time I must admit to having frequently failed.

I would make the following statements as regards diagnosis:

1. A careful measurement of the pelvis both by the hand and by a pelvimeter should be made.

2. An estimate of the size of the child's head should be attempted both by palpation and cephalometer.

3. The relative size of the head and pelvis should be estimated and that should be the basis of treatment.

4. Whenever possible this examination should be made in the thirty-sixth week and again at the beginning of labour if the pelvic deformity is of medium degree.

TREATMENT

We have now reached this point in obstetric surgery that in order to obtain the best results in the treatment of contracted pelvis it is essential that the accoucheur should be able to form a correct estimate of the relative size of the pelvis of the mother and the head of the child. He must be able to predict whether or not spontaneous delivery is likely to occur.

Students and practitioners think, and are encouraged to do so by many text-books, that the treatment in cases of contracted pelvis should be based upon the size of the conjugata vera.

No exception can be taken to such an attitude towards major and minor deformities, but it is an absolutely erroneous one to assume towards medium degrees of pelvic deformity.

But, first of all, let me define these different degrees. By minor pelvic deformity I mean a pelvis where the conjugata vera is over 9.3 cm. (3¾ inches); by major deformity, where the conjugata vera is below 7.5 cm. (3 inches); and by medium deformity where the conjugata vera is between 9.3 cm. and 7.5 cm. (3¾ and 3 inches).

In the major and minor deformities, the size of the pelvis alone determines the treatment, for in the latter spontaneous delivery always occurs; while in the former, the major degree of pelvic deformity, Cæsarean section and craniotomy are practically the only alternatives.

With medium degrees of pelvic deformity, that is to say, the deformities where the conjugate is from 9.3 cm. to 7.5 cm. (3¾ to 3 inches) it is quite otherwise, for in such cases there are several alternative treatments which have to be considered if the child is living. No hard and fast rules can be laid down for cases in this group. Experience alone can teach one how to deal with them. I would say this however: It is absolutely essential to base the treatment upon the relative size of the fœtal head and the maternal pelvis, for in cases in which by pelvimetry the pelves are the same, sometimes one operation, sometimes another, will be found best. This is not yet fully appreciated, these cases are still dealt with arbitrarily and not with discretion, and so the fœtal mortality is very high indeed. The maternal mortality is not so high as might be expected but the morbidity is enormous.

Let us consider the cases of this group and see how the fœtal mortality may be reduced to a minimum, for there is no reason why it

should not be reduced almost to zero. I shall illustrate this by giving the results from my own clinic in the Glasgow Maternity and Women's Hospital.

When I was appointed obstetric surgeon to this hospital, at the end of 1900, it was customary in cases of contracted pelvis to apply forceps very frequently and very early in the second stage. I allowed matters to continue pretty much the same for the first five years. By that time I became so dissatisfied with the results that I changed the arrangements and indicated to my assistants that forceps were not to be employed so frequently. There was some slight improvement but very little until I insisted that no case was to be treated with forceps unless it was absolutely necessary to do so, owing to the condition of mother and child. My results, as you would expect, immediately improved and I give here a table to illustrate this.

FŒTAL RESULTS FROM SPONTANEOUS AND FORCEPS DELIVERY WITH C. V. OF 8.7 CM. (3½ INCHES) AND UNDER, IN AUTHOR'S CLINIC AT TWO DIFFERENT PERIODS

Years	Total Cases	Spontaneous Delivery			No.	Forceps	
		No.	Mortality	Morbidity		Mortality	Morbidity
1901–1906 (inclusive)	83	7	0	0	76	15	25
1909–April, 1911 (inclusive)	46	24	0	1	22	1	2

NOTE.—By mortality is meant that the child was born dead. By morbidity, that it was injured at birth or died during stay of mother in hospital.

You, in this country, may not find forceps employed unwisely, but in Great Britain I am sorry to say it is employed often most unwisely. A practitioner informed me not long ago that he had never yet seen the case of contracted pelvis in which he could not deliver the child with forceps. This attitude towards contracted pelvis is unfortunately far too common.

Let us now consider spontaneous and forceps delivery in some little detail.

Spontaneous delivery. One of the most striking features in connection with the treatment of contracted pelvis is the prominence given by all recent writers to spontaneous delivery. In no country is this more noticeable than in Great Britain, where, as already mentioned, forceps have been so extensively employed for many years.

As illustrating the successful results obtained by spontaneous delivery I show here a table of all such cases that have occurred in my clinic during the last two and a half years.

SPONTANEOUS DELIVERIES WHERE C. V. WAS 9.3 CM. (3¾ INCHES) AND UNDER

Pelvis measurement	Total Cases 53.		1909–April 11, 1911, inclusive	
	No. of Cases	Weight of Heaviest Child	Fœtal Mortality	Fœtal Morbidity
C. V. 9.3 cm. (3¾"). .	29	10 lbs.	0	0
C. V. 8.7 cm. (3½"). .	16	7¼ lbs.	0	0
C. V. 8.1 cm. (3¼"). .	8	7 lbs.	1 (prolapse of cord)	1 (child, which weighed 7 lbs., died 2 days after delivery)

It will be seen from the table how frequent spontaneous delivery is with a C. V. of 9.3 cm. (3¾ inches). (The largest child in this division was 10 pounds.) You will also observe that it is quite frequent with a C. V. of 8.7 cm. (3½ inches) and that at 8.1 cm. (3¼ inches) it occurred 8 times. I have twice seen a child born spontaneously even with a pelvis of 7.5 cm., but no such case has occurred in my clinic during the last two and a half years. As you can imagine, the duration of labour, at least of the second stage, was often many hours, quite frequently 6 to 8 hours. In spite of that, no harm resulted to the mother. There was no maternal death and a negligible morbidity.

We have even had a few cases where the patients were sent into hospital after fruitless attempts to deliver with forceps and in which the child was ultimately delivered spontaneously.

I need not remind you that the following factors influence a spontaneous delivery:

1. Variety of parietal presentation.
2. Size and consistency of head.
3. Position of occiput (especially in scoliorachitic pelvis).
4. Parity of mother.
5. Strength of uterine contractions.

We are all familiar with these factors—it is unnecessary to take time in considering them. I am discussing broad principles, not details.

The all important question in connection with medium deformation is—How far can spontaneous delivery be predicted? I believe one can almost always tell whether or not it will occur, and even supposing one should occasionally be wrong in one's prophecy, one can always fall back on forceps, which in these cases will easily effect delivery.

Forceps. It used to be the custom amongst British obstetricians to employ forceps very extensively in contracted pelves and great deeds of prowess are recorded where children of large dimensions were dragged through deformed pelves of Lilliputian dimensions. I remember a well-known British obstetrician boasting some years ago that he had dragged a normal-sized child through a pelvis with a C. V. of 2.75 cm. It is interesting to know that this measurement was confirmed at the postmortem examination of the mother. In recent years, however, the majority of us have been less inclined to perform these feats of strength. More especially has this been so since we have found the results from spontaneous delivery so satisfactory, as compared with those from forceps employed in the manner indicated.

I show you here a table of 130 cases of contracted pelves treated by forceps. They embrace all the cases delivered in the Glasgow Maternity Hospital during the years 1896 to 1906:

SERIES OF 130 CASES WHERE C. V. MEASURED 8.7–7.5 CM. (3½–3 INCHES) DELIVERED BY FORCEPS IN GLASGOW MATERNITY HOSPITAL

Pelvis Measurement	Total Cases	Alive	Dead	Mortality
C. V. 7.5 cm. (3″).....	39	21	18	46%
C. V. 8 cm. (3¼″).....	52	40	12	23%
C. V. 8.7 cm. (3½″)....	39	33	6	15%
Total.....	130	94	36	27%

You will observe that the fœtal mortality is 50 per cent with a C. V. of 7.5 cm. (3 inches), 33 per cent with a C. V. of 8.1 cm. (3¼ inches), and 15 per cent with a C. V. of 8.7 cm. (3½ inches).

These figures were so unsatisfactory that I have abandoned forceps with a pelvis below 3¼ inches unless the fœtal head is unusually small, and even with a pelvis of 8 to 8.5 cm. I only employ the instrument after carefully estimating the size of head and pelvis. By choosing my cases with great care and by allowing the head much longer time to mould, I have secured infinitely better results, as my figures show.

Here are my figures for the last two and a half years:

SERIES OF CASES WHERE C. V. MEASURED 8.7 CM.–7.5 CM. (3½ INCHES–3 INCHES) DELIVERED BY FORCEPS IN AUTHOR'S CLINIC, GLASGOW MATERNITY HOSPITAL (1909–APRIL, 1911)

Pelvic Measurement	Total Cases	Alive	Dead	Mortality
C. V. 7.5 cm. (3″).....	3	3	0	0%
C. V. 8 cm. (3¼″).....	12	12	0	0%
C. V. 8.7cm. (3½″).....	7	6	1	14%
	22	21	1	4.5%

How striking is the difference in the results in these two tables, 4 per cent as compared with 27 per cent. Only one fœtal death in the last two and one half years. But let me point out how this child died. Gentlemen, it did not die, it was killed. At the time this particular case occurred, it was with the greatest difficulty that I could restrain my then house surgeon from putting on forceps too early. In this particular case the pelvis was flat, the C. V. was only 8.7 cm. (3½ inches), the child when delivered weighed only 7 pounds; more than that, the woman had a febrile puerperium.

But while I am an opponent to the employment of forceps promiscuously in contracted pelvis and to the common practice in Great Britain of pulling the child past the obstructing brim, I cannot go the length of some of the most distinguished obstetricians in your country and the Continent of Europe and condemn entirely the employment of forceps for bringing a child through the brim. It must be admitted that there are cases in which nature just fails to drive the child past the obstruction, in which she requires just a little assistance, these I maintain are suitable cases for forceps. But if the attitude is taken that it is never justifiable to bring the child past the pelvic obstruction with forceps, you will have to perform pubiotomy in all these cases. Is any one here prepared to support such a position?

As regards forceps, the conditions which I lay down are as follows:

1. The disproportion between the head and pelvis must have been such that spontaneous delivery might have been reasonably expected.

2. The second stage of labour must have been allowed to go on until there are indications in mother and child for hastening the delivery.

3. When forceps are applied, the head must be fixed and the operator must expect to be able to deliver with only moderate traction.

No child should die or be seriously injured as a result of forceps delivery. In uncomplicated cases in which these accidents occur the judgment of the accoucheur has been at fault.

But some critics may say, and very rightly, that is all very well, but before we can accept these results we must know about the cases in which you were disappointed and had to fall back on more radical treatment,—craniotomy, pubiotomy, and even Cæsarean section. In this connection, Cæsarean section may be dismissed. In recent years I have never had to perform it late in labour in any case that was under my care at the beginning of labour and in which I computed I would effect delivery *per vias naturales*. In other words, I have never had to fall back on Cæsarean section.

Turning to craniotomy, I find that I have performed this operation 17 times in the last 2½ years. In 12 of these cases the child was dead. In the 5 cases when the child was alive, many examinations, and in 2 attempts at delivery with forceps had been made before the patients were admitted to hospital. In no case seen early in labour had I to fall back upon craniotomy.

But as regards pubiotomy, it is quite otherwise. I had to fall back upon pubiotomy 3 times and symphysiotomy once. All these cases did well, all the children did well. Another case of pubiotomy which came under my care late in labour died—I shall have to refer to this case later. But my cases of pubiotomy have been declining each year.

In 1909 I had three (and one symphysiotomy).

In 1910 I had one.

In this year, 1911, I have had none so far. This has resulted not because I disapprove of pubiotomy—I consider it an excellent operation—but it has a very limited field, as I shall explain:

Pubiotomy. You will all agree that in a paper of this nature the relative merits of symphysiotomy and pubiotomy cannot be discussed. Personally, I believe pubiotomy is the better, although I cannot admit that the advantages are so great as many modern writers indicate.

Now, gentlemen, both symphysiotomy and pubiotomy are in a very critical position. I am absolutely convinced that pubiotomy is a most valuable operation and I sincerely hope it will continue to have the support of obstetricians. It will, however, continue to have the support of obstetricians only if it is chosen and employed with great discretion. Any one who has been following the trend of obstetric surgery must be impressed by the fact, that the lowest limit of pelvic deformity in which pubiotomy is considered justifiable, has been gradually creeping up. In most cases it has been proved to be a dangerous operation if the C. V. is below 7.5 cm., and many, of whom I am one, do not perform it if the C. V. is much below 8 cm. The operation of pubiotomy as regards the lowest limit of pelvic deformity at which it should be considered has ceased to be an "operation of election." One cannot say early in labour, "this is a suitable case, in this patient I will perform pubiotomy." Any one who adopts such an attitude has not yet learned to appreciate the refinements in the treatment of contracted pelvis. If an accoucheur believes that spontaneous delivery or easy forceps delivery will not occur he should choose Cæsarean section. Pubiotomy is the reserve operation, the operation for "push time." The accoucheur having carefully estimated the relative size of head and pelvis believes that spontaneous delivery will occur, he leaves the case to nature. Spontaneous delivery does not take place; he is forced to interfere, he makes one trial with forceps (in the Walcher position if the pelvis is flat). Still the child's head does not come

past the obstruction; then he performs pubiotomy. My own feeling in the matter—it is simply my own opinion, and I give it for what it is worth—is that we have now reached the point that the number of pubiotomies in the practice of an obstetric surgeon are in inverse ratio to his diagnostic skill and judgment. We are all compelled to perform pubiotomy sometimes, that cannot be avoided, but we have been forced to reserve it for the cases I have indicated and only if we reserve it for these cases will our results be uniformly satisfactory. Some critics I know will take exception to this attitude, but my reply is that it has now been proved that even although pubiotomy is performed, delivery has to be completed with forceps if the best results are to be obtained. Only one other point, should one perform pubiotomy in suspect or possibly infected cases? I think if one limits the operation only to the cases I have indicated, one certainly may do so, provided always the child's heart sounds are satisfactory. In such cases, so carefully selected, there is no chance of any serious laceration of the vagina and consequent infection of the pelvic cellular tissue. But if one has to deal with a case where the disproportion is such that there is a considerable risk of vaginal laceration occurring, then pubiotomy is attended with great danger and one should perforate the child even although it is alive.

A moment or two ago, I said I had one death from pubiotomy. It occurred in a case in which I performed the operation really against my better judgment. The case was advanced in labour, had been examined and probably infected. I felt that the disproportion between brim and pelvis was just a little too great, but the child was alive and I was tempted and fell. The result was disastrous, the child was born dead and the patient developed sepsis and died. I was absolutely to blame for that death just as my assistant was to blame for the single fœtal death amongst the forceps cases.

Induction of premature labours. So far I have said nothing about induction of premature labour, an operation which has always been and still is much favoured by British obstetricians. My own results in hospital have not been satisfactory, for the early and late mortality is slightly over thirty per cent, but in domestic practice, the results have been uniformly good. The reason for this, I believe, is that in hospital cases, it is often very difficult to obtain the exact date of the last menstrual period and so one cannot determine the correct period to which pregnancy has advanced. I am convinced this operation is a most valuable one for domestic practices and I still am prepared to employ it in very carefully selected hospital cases.

The conditions which I have laid down for my own guidance are the following:

1. The conjugate vera must be not less than 8.1 cm. (3¼ inches).

2. The pregnancy must have advanced at least to the 36th week.

3. The patient must be a II para at least, a first labour is a "test labour."

4. In the 36th week, the patient is examined under anæsthesia and the relative size of head and pelvis determined. Labour should be induced if the head can be made to bite the pelvic brim. If the head is too large for the pelvic brim Cæsarean section at term is the only operation and if it is small and can be pushed into the pelvis, pregnancy should be allowed to continue for ten days and an examination under anæsthesia repeated.

In the remainder of the time at my disposal I desire to consider the treatment of the major degrees of contracted pelvis when these operations we have been considering are out of the question and Cæsarean section and craniotomy are the only alternatives.

As regards the latter, craniotomy, we are all agreed I think, that it should be the aim of those who practice obstetrics to limit it to cases in which the fœtus is dead. I do not believe, however, that we have yet reached this ideal state of matters. I am convinced that in the interests of the mother, the family, and the state, it is sometimes justifiable, indeed it is sometimes the best treatment to perforate a living child; I shall refer to this in a moment or two. Speaking generally, craniotomy is seldom a difficult operation if the C. V. is above 7 cm., but it becomes increasingly difficult as one passes below that figure, and below 5.5 cm. it is

dangerous. I shall not delay over this aspect of the subject, but shall confine myself now to Cæsarean section.

In recent years much interest has been aroused regarding several points connected with Cæsarean section, e. g., the uterine incision, the sterilizing of the patient, dealing with suspect or infected cases. As I cannot consider details in this paper, but must confine myself to broad principles, I must be satisfied with a very brief consideration of this one point, viz.: the treatment of suspect and infected cases of major degrees of pelvic deformity, and leave the two other interesting questions unconsidered.

The interest that has been aroused in Cæsarean section in the last year is largely the result of the most admirable and exhaustive work by Amand Routh, of London. Routh[1] has collected all the cases of Cæsarean section performed in Great Britain. He then divided the cases into four groups as shown by the following table. In this table he clearly demonstrates how extremely dangerous the operation of Cæsarean section is in suspect cases. Here is Routh's table:

Condition	Cases		Maternal Deaths		Percentage Mortality	
CLEAN						
A. Not in labour	245	489	9	14	3.6	2.9
B. In labour, membranes intact	244		5		2.2	
SUSPECT						
C. In labour, membranes ruptured	166	230	18	40	10.8	17.3
D. Frequent examinations or attempts at delivery	64		22		34.3	

B. or "Onset of labour" or "In labour but in hospital some days."

You will observe from this table that in suspect cases the maternal mortality is 17.3 per cent and if frequent examinations have been made it runs up to 34 per cent. With such a figure it is quite obvious that ordinary Cæsarean section is hardly justifiable and so many of us have been trying to arrive at the best substitute for the ordinary operation in such cases. The substitutes which have been suggested are:

1. Craniotomy. 2. Pan-hysterectomy. 3. Extra-peritoneal Cæsarean section with or without Sellheim's uterine fistula.

[1] Journal of Obstetrics and Gynæcology of the British Empire, January and February, 1911.

1. *Craniotomy.* Craniotomy in suspect or infected cases has a maternal mortality of eight per cent. In the cases of the dead or dying child it is the only treatment to be considered, except in extreme degrees of pelvic deformity when, of course, Cæsarean section must be chosen. But such cases, where the C. V. is under 2½ inches, are not common. In the case of the living child it is certainly most unfortunate to destroy the child, but in many of these "suspect" cases, the child already has had its vitality impaired and the fœtal mortality, even by Cæsarean section, is quite considerable. In a young healthy woman therefore I consider that craniotomy is at present the safest treatment to adopt in such cases, for the woman in all probability will again become pregnant if one leaves the uterus. At the end of subsequent pregnancy one can perform the operation of Cæsarean section under favourable conditions.

2. *Pan-hysterectomy.* If Cæsarean section is performed in these suspect cases, undoubtedly the best results are obtained by removing the uterus. The operation of pan-hysterectomy rather than subtotal hysterectomy should be chosen, because if one employs subtotal hysterectomy one leaves behind the portion of the uterus chiefly infected by the repeated examinations and manipulations. It has always appeared to me, however, an unfortunate proceeding to deprive a young woman of her uterus simply in order to prevent the occurrence of sepsis in the puerperium, especially as one will lose in these cases a considerable number of mothers (fifteen per cent) and as I have already stated, an appreciable number of children. The cases in which it seems to me this operation is suitable are those women who have nearly reached the menopause, and who in consequence will probably not have another chance of again becoming pregnant.

3. *Extra-peritoneal Cæsarean section.* You are all familiar with the operation of extra-peritoneal section as performed by Dœderlein. It is certainly the most extra-peritoneal method. His last paper (Monat. fur Gebr. u. Gyn., Jan., 1911), is very fully illustrated. You will remember how the abdominal

incision employed runs from the anterior superior spine to the pubes parallel to Poupart's ligament. The cellular tissue is opened into, the bladder pushed over to one side, a lateral incision is made into the lower uterine segment and the child is extracted with forceps through this incision. Now I cannot conceive that this operation will give better results in suspect cases than the ordinary classical operation, for the cellular tissue is extensively opened up, and that seems to be the general opinion of obstetric surgeons. Even with the addition of Sellheim's fistula for drainage it is very doubtful indeed if this mode of procedure will ever come into favour in suspect cases. There is only one advantage I see this method may have, viz.: that a cicatrix of a carefully stitched wound in the lower uterine segment may be firmer than one in the active contractile body.

In connection with these "suspect cases" we must try and devise if it is at all possible, some treatment less radical than hysterectomy and that will not involve the sacrifice of the child, for both operations are unsatisfactory in the cases under consideration. Now is there any improvement in technique by which we could secure this? Some time ago I suggested, and Edge Wolverhamptom recently made a similar suggestion, that after the extraction of the child the placenta and membranes should be pushed down into the vagina rather than pulled up and delivered through the uterine wound. The object of this procedure is to prevent the carrying up from the infected cervix and vagina of organisms which are undoubtedly there in abundance. In delivering the placenta and membranes in the ordinary way through the uterine wound the ragged and infected ends of the membranes are dragged up over the uterine surface, which after the separation of the membranes is an ideal field for their development.

Routh, in his recent paper to the Royal Society of Medicine, attached some importance to the suggestion of Maxwell to wash out the amnionic cavity with a saline solution. I cannot imagine this procedure will be of much advantage, for how is it possible to wash out the amnionic cavity? My procedure is as follows:

I very carefully wash out vagina, cervix, and child's head with liquid soap and normal saline solution. I then place patient on operating table with her pelvis slightly lower than her head. I cleanse her skin by iodine method. The abdomen and uterus are opened in the ordinary way, and the abdominal cavity is carefully protected from contamination with gauze swabs. The child is extracted by the feet. I now remove my gloves and put on a fresh pair, separate placenta completely and cover it over with a gauze swab and then push the swab and placenta down into the vagina. Several more swabs are then pushed down through the cervix and removed by an assistant, *per vaginam*. The rest of the operation is completed in the usual way.

But I must draw to a close, for although I have only touched upon a few of the interesting questions connected with deformed pelves, I feel I have already taxed your patience. The treatment of contracted pelvis is such an engrossing subject to obstetricians that when speaking of it one forgets how time passes. I trust my remarks have been of some interest and have indicated sufficiently clearly one course of procedure, which if followed, is attended with satisfactory results.

But, gentlemen, what will lower the mortality and morbidity, both material and fœtal, more than anything else is a more thorough training of students and young graduates to appreciate the importance of an early diagnosis of pelvic deformity and the limitations of every operation which may be employed. As in so many other obstetrical and gynæcological complications, such as eclampsia, carcinoma of the cervix, etc., the all important matter for successful results is an early diagnosis of the condition. Until that is more fully appreciated, "craniotomy" will remain an operation of necessity in some cases in which the child is alive instead of being reserved only for cases where the child is dead.

Again let me thank you, Mr. President and Fellows, for the great honour you have done me, for the hearty welcome you have given me, and for the great courtesy and patience with which you have listened to this address.

SALPINGOSTOMY AND PREGNANCY[1]

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MODERN surgery of the uterine appendages has reached the stage of preservation. It is, however, only the ovary which is benefited by this gradual change of attitude while the tubes are excluded from any tendency towards conservation and, as a recent writer expresses it, "the total removal of a permanently crippled structure (is) not only the safest future for the patient, but also the ultimatum of ideal conservatism." (1) This standpoint, which has been the key note of all discussions within the last five or six years, is undoubtedly correct in the greater majority of cases; but there are still a number of instances left in which less radical procedures might well be worth our consideration. To give at once a precise definition, I desire to limit my remarks strictly to occluded tubes encountered in the course of a laparotomy when the question arises of preserving for the patient the possibility of further offspring. I have been in the habit, for a number of years, of performing a plastic operation on such tubes in all suitable cases. This operation consists either in a resection of the peripheral portion of the tube, or better still, in an incision through the occluded fimbriated extremity together with fixation of the everted flaps to the serosa of the tubes by means of a few fine catgut or linen sutures.

That such an operation can be followed by conception, is well illustrated in the following case.

Miss L. B., 24 years old, was referred to me by Dr. Hugo Rothstein of this city for a sudden attack of severe abdominal pain accompanied by high fever which for three days had resisted the usual therapeutic measures. Patient presented the characteristic signs of an acute peritonitis. The distension of the abdomen prevented any accurate exploration. The etiology was entirely obscure. Appendicitis could be excluded with a high degree of probability. Patient was transferred to a hospital and dry heat treatment was cautiously instituted. Within the next three weeks the physical signs of peritonitis had completely subsided, and a cystic mass of the size of a woman's fist could now be mapped out in the region of the left adnexa.

Nov. 26, 1904. Laparotomy. Uterus and both adnexa completely enveloped in adhesions. Left adnexa transformed into a true tubo-ovarian cyst. Extirpation of the tumor. Right ovary normal. Right tube occluded and distended. On splitting open the abdominal extremity of the tube, a minute trace of a brownish secretion could be wiped off. Therefore salpingostomy on this side. Appendix normal. Ventrosuspension of the uterus to secure its normal position and to cover its raw surface where adhesions had been severed. Complete recovery.

Thus far the case did not present any marked peculiarities. The patient married about a year after the operation, continued to enjoy good health but practiced preventive measures a number of months for fear the abdominal incision might not stand the strain of a possible pregnancy. Having been properly instructed, she omitted anticonceptional means and promptly conceived. On June 20, 1908, she had a spontaneous delivery and is now approaching the normal end of her second pregnancy.

The operation carried out in this case with such gratifying results, is by no means of recent origin. August Martin (2), in 1885, first devised this method of restoring the normal function of the tube. The operation which Skutsch (3) later termed salpingostomy, has never become very popular and the publications of subsequent conceptions have been very meager. E. Kehrer (4) who, less than two years ago, reported a case of pregnancy following salpingostomy on one side and salpingectomy on the other, found only four other cases in literature — recorded by Martin himself and Mackenrodt. Prochownik (5) mentions successful results obtained by Skutsch, Gersuny, Pozzi and others. In addition to these cases the following instances have been published in this country. W. M. Polk (6) removed the right adnexa in a patient aged 22. On the left side was a hematosal-

[1] Read before the American Gynecological Society, May 23, 1911, at Atlantic City.

pinx which was amputated just inside the dilated portion, about an inch from the uterus, and the stump was attached close to the ovary. Two years later the patient was delivered of a healthy male child. R. C. Turk (7) had two pregnancies in eight cases of salpingostomy. L. C. Morris (8) of Birmingham, Alabama, removed a large pyosalpinx on the left side and resected the outer two-thirds of the right tube which also contained pus. The patient became pregnant about four months later and has since given birth to a healthy child (personal communication). This case is almost identical with the one mentioned by C. L. Bonifield (9) who in a case of bilateral pyosalpinx, removed one tube in its entirety and one-half of the other, yet the patient afterwards gave birth to a child.

Very likely there exist other cases which have not been reported. Some authors merely mention the possibility of restored tubal function after salpingostomy. M. Rosenstein (10) suggests the plastic operation, if at the extirpation of an ectopic tube, the other be found to be occluded. E. Reynolds (in a personal communication) stated that the conservative surgery of the tubes has been to him disappointing. "I cannot be sure without looking over my records how seldom I have seen a conservative operation on the tubes followed by a pregnancy, but I am sure that it has been very seldom. I have several times reopened an abdomen for other reasons after such an operation and on each of these occasions have found the tubes sealed; on the other hand, I have seen no ill effects and in non-virulent long standing tubal inflammation am still inclined to give the patient the benefit of the doubt by conserving as much of the tube as possible." J. G. Clark (11) feels rather antagonistic towards salpingostomy: "Conservative surgery has a very limited field. The only cases in which a salpingostomy is ever justifiable is in old non-active hydrosalpinx. The end results of salpingostomies are disappointing. Pregnancy rarely takes place, as the newly formed ostia quickly become occluded and cause a recurrence of symptoms."

We may then safely sum up that even with the cases which might not have found their way into print, the chances of conception have been very slender. But since the occurrence of such cases is an undeniable fact, be their number ever so small, it is but logical to ask two questions, viz.:

1. Why are plastic operations on the tubes not oftener followed by conception?

2. What can be done to increase the percentage of subsequent pregnancies?

It is perhaps possible to suggest an answer to both questions simultaneously. It seems probable that the infrequency of pregnancy following salpingostomy is due, in the first place, to faulty selection of cases suitable for the operation. Obviously the legitimate field for plastic operations on occluded tubes is very limited. West (12) estimated from the bacteriologic findings of the tubal contents, that occlusion was primarily due to gonorrhœa in 62½ per cent. Perhaps this percentage is even higher if we also consider those cases of tubal occlusion in which the pus has become absorbed. All such cases should strictly be excluded. Not only does clinical experience speak against leaving gonorrhœal tubes behind, but also microscopical investigations among which the most recent are the exhaustive studies by H. Schridde (13) show clearly that the gonococcus destroys the ciliated epithelium of the tube and produces coalescence of neighboring or opposing folds of the mucosa. Even though the pus may become sterile in the course of time, there still remain the changes in the mucosa which militate against the normal transport of the ovum into the uterus should fertilization actually have taken place. But as a rule the spermatozoa are not likely to reach even the tubes, for the gonorrhœa in the uterine mucosa which necessarily preceded the affection of the tubes, would render their passage through the uterus impossible. Moreover, as Boldt (l. c.) very justly points out, a large proportion of the husbands of such women have azoöspermia so that the question of fecundation from that source may also be dismissed. Any attempt, then, to restore by an operation the normal function of a tube occluded because of gonorrhœa appears *a priori* destined to failure.

The objection that must be raised against the conservation of gonorrhœal tubes holds

equally good with respect to tuberculosis in which only radical measures are justifiable.

Infection of the tube with streptococcus or staphylococcus has, according to Schridde's (13) investigations, a less destructive effect upon the tubal mucosa. A *restitutio ad integrum* seems possible, after the occlusion has been relieved, as is illustrated in the case of Morris referred to above. In this instance a self-induced abortion resulted in an infection of an unusually mild nature as evidenced by the fact that in spite of leakage of pus during the operation not the slightest peritoneal reaction took place.

But who could tell at the operation whether the pus in the individual case was sterile or at least attenuated? Bacteriologic examinations of pus during an operation are more frequently demanded on paper or in discussions than actually carried out. They are possible only under such favorable conditions and with an ideal system such as but few operators have at their command.

On the other hand, where there is pus present in a tube thus treated conservatively there is always the possibility of secondary contamination of the peritoneum and the probability that the purulent process within the tube will again lead to occlusion of the newly formed ostium.

It seems, therefore, logical to demand that the host of cases in which pus is encountered in the tube, no matter in which stage or from what source, should be excluded from salpingostomy.

A greatly distended hydrosalpinx whose muscularis and mucosa have undergone irreparable changes, would equally contraindicate any conservative operation.

There remains, then, only a minority of cases in which salpingostomy appears not only justifiable but even promising of satisfactory end results. Broadly speaking these are cases in which the occlusion of the tube has been caused by factors from without, in contradistinction to the categories mentioned in which the occlusion was produced by agencies from within the tubes. In this connection we have to consider mainly two sources, viz., ectopic pregnancy and appendicitis. In the former, the irritation of the peritoneum may cause an occlusion of the other tube either directly or by means of the inundation of blood which secondarily seals up the fimbriated ostium. There is, as a rule, no infection present and the second tube may well retain or regain its normal function. In ruptured extrauterine pregnancy the precarious condition of the patient will often forbid any attention to the tube of the other side, and this is an additional incentive towards diagnosing these cases early and before rupture so that we may be able to take the time of restoring the function of the tube. Kehrer's case (l. c.) clearly illustrates this point. His patient was operated upon for ectopic pregnancy on the right side and the left tube was found to be the size of a thumb, greatly hyperæmic and firmly occluded. The right adnexa were removed. The distended extremity of the left tube was incised and kept open by four catgut sutures. The tubal mucosa was markedly swollen and there was a trace of a brownish fluid within the tube. This patient conceived less than two years later and gave birth to a living child.

Rosenstein (l. c.), too, favors salpingostomy when operating on the other tube for ectopic gestation, as mentioned above.

In interval operations for chronic appendicitis I have, for years, restored occluded tubes, if there was no sign of suppuration, and I found that Kehrer advocated a like course.

This author, too, suggests salpingostomy in cases of hydrosalpinx of moderated extent if the walls of the tube are still fairly thick, and I would add to this list of indications the cases of hematosalpinx the etiology of which is so frequently obscure.

It must be admitted that the personal equation of the operator will play an important part in the proper selection of cases for the salpingostomy. It is, after all, a matter of individual judgment whether or not the tube appears to be in a condition capable of restoration of function. But this experience can be acquired by every one and if the gynecologists as a whole will only take up the question of salpingostomy it will soon be possible to define the field of this operation more distinctly than lies in the power of a single operator.

Aside from the proper selection of cases we have to reckon with the possibility of a recurrence of the occlusion. In this connection I have been able to verify the late effects of salpingostomy in three cases, in which I had to reopen the abdomen for other reasons.

CASE 1. Patient, 29 years, married four years, sterile, very anxious to have children, suffering from dysmenorrhœa.

May 8, 1909. Laparotomy. Enucleation of two intramural fibroids. Very extensive pelveo-peritonitic adhesions. Bilateral salpingostomy. Vaginal enucleation of submucous fibroid. Undisturbed convalescence.

August 22, 1910. Laparotomy for appendicitis. Again very extensive adhesions forming a roof over the small pelvis. Right ovary size of goose egg. Right tube *patulous* with two of the four linen sutures still in place. This tube which a year ago resembled in size and color a loop of intestine has now the size of a woman's little finger. Left tube could not be inspected without tearing the peritoneal adhesions.

CASE 2. Woman of 30. March 17, 1906. Laparotomy for appendicitis. Appendix firmly adherent to small multilocular cyst of right ovary and occluded and distended right tube. Removal of appendix in connection with right adnexa. Enucleation of interstitial fibroid. Left tube occluded, containing no secretion. Salpingostomy.

December 12, 1906. Left adnexa small, movable, not sensitive.

January 23, 1908. Left adnexa normal.

October 25, 1910. Attacks of pain in left side in last two weeks.

November 3, 1910. Laparotomy. Extensive omental adhesions. Tumor of left adnexa, adherent to abdominal wall and bladder, consists of an orange-sized multilocular ovarian cyst with which the greatly distended and *occluded* tube is most intimately connected.

CASE 3. Woman of 24. August 21, 1906. Laparotomy for unruptured ectopic pregnancy. Extirpation of right adnexa. Numerous fresh adhesions everywhere, particularly around left adnexa. Left ovary normal. Left tube occluded. No trace of fimbriated ostium. Salpingostomy. No tubal secretion.

November 27, 1909. In good health since operation. Acute appendicitis.

December 16, 1909. Interval operation. Appendectomy. Numerous delicate and fresh adhesions around uterus and right adnexa. Right ovary slightly enlarged. Right tube again *occluded*, showing upon its closed extremities a few marks indicating former operation. Second salpingostomy attempted, but given up as the sutures tear out and the operation has already lasted too long.

An analysis of these three cases shows that in one the tube was found patulous more than a year after the salpingostomy. In the second case the tube decreased in size and remained clinically quite normal for almost four years until a secondary illness occurred. This woman was deserted by her husband while convalescing from her first operation, so that pregnancy could not possibly have taken place. In the third case, finally, it is doubtful whether the occlusion occurred soon after the salpingostomy or was due to the intercurrent appendicitis three years later; at any rate, she was in good health for three years after the operation.

The adhesive pelveo-peritonitis has persisted in case 1 and frustrated the result of the salpingostomy although the tube on the right side was found patulous a year later.

This continuation of the same pathologic process which caused the tubal occlusion in the first place is a difficult problem to be overcome. At the meeting of this Society in New York in 1909 I have shown (14) that at the present time there exists no absolute method of preventing severed peritoneal adhesions from re-formation. In another article (15) I have mentioned that I have received the impression clinically that the application of high degrees of dry heat after laparotomies seemed to check this return of the adhesions inasmuch as slight elevations of temperature not explainable on any other grounds, promptly disappeared after a few treatments. I have not yet had the opportunity of testing this principle frequently enough in cases of salpingostomy to improve, if possible, the final results.

In cases 2 and 3 a second intra-abdominal affection accidentally destroyed the effect of the former salpingostomy. I can see no way of guarding against such unforeseen complications unless one were willing to remove the appendix, though healthy, in every laparotomy.

All these remarks try to explain why salpingostomy is not more frequently followed by conception. This infrequency of functional results alone should not deter any one from doing a salpingostomy wherever indicated. A more potent objection would be the question whether by doing a salpingostomy we might harm our patient, i. e., cause illness or discomfort and even be responsible for a sec-

ond operation. Like Reynolds, I have thus far not seen any ill results from the conservative operation. I should, however, emphasize that I have strictly limited salpingostomy to cases that conformed with the indications given above and consequently performed the operation only in eleven cases all but one I have kept under control.

To sum up, then, we may say:

1. That salpingostomy is indicated: (a) where children are desired; (b) if the occluded tube contains no infectious matter; (c) if the tubal mucosa seems intact or still capable of reparation.

2. That, while its field is rather limited, salpingostomy has been followed by pregnancy in a few cases.

3. That with proper selection of cases and perhaps by appropriate after treatment the end results might become more promising.

4. That salpingostomy *per se* adds no danger to the patient.

BIBLIOGRAPHY

1. Lott, H. S. Am. Journ. of Obst., 1911, lxiii, 472.
2. Martin, August. Die Krankheiten der Eileiter, Leipzig, 1895, 213.
3. H. Skutsch. Centralbl. f. Gyn., 1889, No. 32.
4. E. Kehrer. Monatsch. f. Geb. u. Gyn. Oct., 1909.
5. H. Prochownik. Real-Encyklopædie der Geb. u. Gyn., 1900, ii, 332.
6. W. M. Polk. Quoted from H. A. Kelly, Operative Gynecology, 1st ed., 1889, 192.
7. R. C. Turk. (Quoted by Clark.) New York Med. Jour., 1909, lxxxix, 1193.
8. L. C. Morris. Am. Journ. of Obst., 1910, lxii.
9. C. L. Bonifield. Ibid., xlviii, 1903, 658.
10. M. Rosenstein. Monatsch. f. Geb. u. Gyn., 1910, xxxii, 435.
11. J. G. Clark. Surgery, Gynecology and Obstetrics, 1910, xi.
12. West. (Quoted from H. J. Boldt.) Am. Journ. of Obst., lv, No. 4.
13. H. Schridde. Die eitrigen Entzündungen der Eileiter, Jena, 1910.
14. G. Gellhorn. Surgery, Gynecology and Obstetrics, 1909, ix, 505.
15. G. Gellhorn. Am. Journ. of Obst., 1909, lx, No. 1.

SALPINGITIS[1]

By FRANK T. ANDREWS, M. D., Chicago, Illinois

ONE year ago to-day, opening a general discussion, Sir A. E. Wright addressed the Royal Society of Medicine upon the subject of vaccine therapy, its administration, value, and limitations. There were thirty-four contributors to the discussion. I quote the preface to the published report as indicating the qualifications of the speakers and the authority with which they speak.

PREFACE

This volume contains the report of the second general discussion held by the Royal Society of Medicine.

It was considered that the time had come when a full statement as to the value of vaccine therapy, as far as is known at present, would be welcome, and, on behalf of the Council of the Society, invitations were issued by Dr. Arthur Latham (Hon. Secretary) to those who had, during the past few years, devoted themselves to special work in this branch.

The first meeting took place on May 23, 1910, when the opening address was delivered by Sir Almroth Wright. The discussion proved of such general interest that it occupied six meetings of the Society.

It is hoped that the present publication will be of great service to practitioners in general, giving them a clear idea of the scope and aims of the method and the results hitherto achieved. John Nachbar, Editor.

In this volume we have the very last word from the best British workers. On every page is something worth assimilating, but the formula for curing salpingitis is not there. Evidently the limitations are very great.

On the third day of May, 1910, at the meeting of the American Gynecological Society in Washington, your committee, composed of J. Whitridge Williams, M. D., Edwin B. Cragin, M. D., and Franklin S. Newell, M. D., made their report on vaccine therapy in gynecology and obstetrics. This report is by far

[1] Read before the American Gynecological Society, May, 1911.

the best bit of gynecological literature of the year. It is worth reading many times. The conclusions of the committee are disappointing but true.

That we cannot cure salpingitis by vaccine therapy is disconcerting. The limitations are certainly effective up to date.

Salpingitis is not a disease by itself. It is a part of general pelvic inflammation. It is referred to as an entity because of the distressing symptoms and dire consequences which follow when the infection reaches the tube. It is the part of the disease which gives us the greatest concern, and whose evil effects we are most anxious to combat. To plan an attack or even to follow the campaign intelligently we must know the field of battle, the forces marshaled and the limitations to action. Now the field of action is not the pelvis alone; the forces are not test-tube bearers and the limitations to action are many.

Pelvic inflammation, in the majority of cases, begins as an acute vulvar or vaginal or uterine infection with a tendency to spread through the tubes to the pelvic peritoneum.

The infecting agent may be gonococcus, streptococcus, members of the colon bacillus group, pneumococcus or staphylococcus. Each variety, having its many grades of virulence, varies also in the intensity of its virulence as the case proceeds.

Nor is it necessary to suppose that the mere presence of a given germ on the vulva or in the vaginal secretion proves disease. Any of them by reason of lack of virulence, or because of specific immunity on the part of the tissues, may lead a purely saprophytic life, not entering into the infective process and yet being discoverable in the secretions; or having at one stage been a distinct cause of the inflammation, they even may have ceased to exist, as we so often find is the case in pyosalpinx when examination reveals sterile pus in the tube, or again only streptococci when we know that the original infection was gonorrhœal.

Patients differ in their power to resist or combat infection and this resistance is not a fixed state but changes constantly during the progress of the disease.

Resistance is not synonymous with vitality, endurance, or strength, but is absolutely specific being developed in and by the tissues in response to inoculation by a given antigen or antigens. The intensity of the inflammation represents the balance between the amount of infection as represented by the quantity and virulence of the microbes and the resistance of the patient's tissues at the moment. It must be noted also that resistance or immunity is not always general but that one part or tissue will have acquired an immunity and yet the inflammation may have passed on to another area to run a course more or less modified.

A pelvic inflammation therefore varies not only in its course and intensity, but the infecting agent itself is found to change in its specific qualities or even to die out and perhaps to have another take its place.

A puerperal infection runs a fulminant course when an overpowering quantity of virulent streptococci are taken into the lacerated lymph channels of a woman whose resistance is diminished by the puerperium.

Perhaps the more typical case is that of the ordinary gonorrhœa. Its course from acute vulvitis to chronic salpingitis and even to pyosalpinx, with the attendant pelvic adhesions is familiar. Pelvic inflammation tends to recovery, if the patient lives long enough. Recovery takes place through repeated or continuous spontaneous auto-inoculation, which makes for immunity. The element of time is indispensable to the process, and time is long.

The invalidism from pelvic adhesions, and other sequelæ, remains. The disease may be cured but the patient is still an invalid. In other cases the germ disappears from the genital mucosa but years afterward is to be discovered in some distant joint cavity or perhaps in the pelvis of the ureter.

As operators we know well the changes that have been taking place in the tube by which both the uterine and abdominal ostia become sealed. The tube is now an abscess sac increasing in size and weight. By reason of weight it sinks by a backward rolling movement toward or into Douglas' pouch.

The weak place in the sac is the point where the fimbriæ are glued together to seal the abdominal end. Some quick movement or the gradually increasing pressure causes a rup-

ture at this weak spot and pus escapes into the pelvic cavity. A peritonitis ensues, but it is local. The patient is in bed with pain and temperature for a few days and then is as well as before the rupture, until the next attack due to another rupture. In some cases such leakages are frequent. An operation at this stage would disclose the conditions described.

After finding the plane of cleavage, the pus sac is easily lifted from its bed by rolling it upwards and forwards in the path it used in descending.

The adhesions due to the attacks of peritonitis must however be separated as the tube is lifted. Usually a sudden gush of pus rewards the operator when he separates the fimbriated extremity from its point of contact with the back of the broad ligament or other tissue. To wipe out the pus and remove the sac is the next step. No elaborate peritoneal toilet is required. The abdominal wound should be closed without drainage even though the peritoneum has been soiled with pus in which the microscope shows pyogenic cocci.

One has courage to do this with confidence of good results if he but remember that this same pelvic peritoneum has been soiled many times before by the leakage from the pyosalpinx. Once more will do no harm and furnishes a practical demonstration of at least a certain degree of acquired immunity.

Moreover this very operation, while removing the pus sac, the reservoirs of infectious material, has induced an auto-inoculation in new wounds in the pelvis, and so aided the approach to immunity. This brings me to a new observation that I think is true, but that I have not been able to establish definitely, namely; that in gonorrhœal cases the vulvovaginal inflammation diminishes rapidly after the tubes have become infected and especially when pyosalpinx is established. Also that the operation for the removal of the pyosalpinx has a still further curative effect as an induced auto-infection. This is a very difficult matter to prove or disapprove by smears and cultures, but the clinical fact remains that it is a very rare occurence to keep a patient, after convalescence from pyosalpinx operation, in the hospital in order to treat her gonorrhœa.

Obviously the subject of vaccine therapy must arise for discussion in the case of any infection that tends to self cure. If, with reasonable certainty within a reasonable time we can cure by vaccine, then operation is criminal. So we must meet, squarely, the question of whether or not, in the present state of the art, we shall attempt to cure pelvic infection by inoculation. The answer from the laboratory is definitely negative, and the laboratory has furnished all our knowledge up to date. Of course it is understood that vaccines are contraindicated in the acute stages of this or any other pyogenic process. The toxins are already in excess in the tissues, and to add more would be folly. Furthermore, no efficient antitoxin has as yet been produced for the toxins of the pyogenic organisms. This leaves, then, the chronic form to be considered, and we all know that chronic gonorrhœa and other pyococcus infections are often cured by vaccines. Then why may we not use autogenous vaccines in our salpingitis cases?

One limitation to their use is to be found in the anatomic relations of the Fallopian tube to the pelvic peritoneum. Each injection (and very many are needed) is followed by a decided reaction. Such reaction, being marked by an increase in the intensity of inflammation in every infected part, would mean much local peritonitis with its usual results, and perhaps a diffused peritonitis with death. Another danger in cases such as these in which spontaneous auto-inoculations are taking place, is that the spontaneous inoculation, or rupture of the tube, may occur soon after an inoculation with autogenous vaccine. The effect of this would be the same as of a greatly increased dose of the toxin in a patient with an acute exacerbation of the pelvic trouble; that is, the effect of the vaccine would be greatly to increase the severity of the acute attack. I believe that treatment by immunization has almost infinite possibilities for the future, but that the present state of our knowledge does not warrant us in experimenting upon our patients.

The battle will be won only when we can produce immunity with impunity.

ANTEFLEXION OF THE CERVIX AND SPASM OF THE UTERINE LIGAMENTS IN RELATION TO RETROVERSION, DYSMENORRHŒA AND STERILITY[1]

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THE theorem which I wish to present to you, and to defend so far as the facts in my possession permit, contains the following points:

1. All the structures which support the uterus are now known to be more muscular and less ligamentous in character than has been commonly supposed, but the anterior attachments of the cervix are more rigid and less muscular than any of the other supporting structures.

2. Spasm of these muscular structures (the uterine ligaments falsely so-called) plays a more important part in the production of the symptomatology of pelvic disorders than has been usually supposed.

3. The condition known as anteflexion of the cervix is an arrest of development in which the persistence of an underdeveloped anterior vaginal wall and anterior attachments of the cervix is a factor of much importance.

4. Study of the preceding points furnishes a satisfactory explanation of the mechanism by which anteflexion of the cervix produces dysmenorrhœa and sterility, and indicates a rational and successful method of treatment for their relief.

5. Since in these cases the cervix is held forward by essentially non-muscular structures, while the other pole of the uterus, the fundus, is held forward only by muscular structures which are capable of relaxation, the existence of an anteflexion of the cervix implies necessarily a predisposition to retroversion which must be taken into account in all operations upon utero displacements in which this factor exists.

It is now about eight years since the muscular character of the uterine ligaments first began to seem to me a fact of probable clinical moment, and since that time my estimate of the importance of their muscular contractility has steadily strengthened under continued observation, but since their muscular composition has as yet received but little attention outside of anatomical literature, and the clinical importance of their spasms has been till now apparently unnoticed in gynecological writings, it seems proper to preface any consideration of this subject by some quotation of modern anatomical authorities upon the structures of the ligaments and by a brief citation of any available evidence that such spasm is in fact common.

The proofs that the so-called uterine ligaments are essentially muscular in structure are derived both from direct anatomical study, and from the accepted laws of comparative anatomy. These proofs might be reinforced, and in addition the clinical importance of the muscular character of these structures might also be deduced from clinical observation of both their physiological and pathological contractility in the living subject were it not for the fact that the direct study of the physiological conditions of the female genitals is for obvious reasons so impossible that we are obliged here to rely mainly upon observations of pathological spasm.

Anatomical argument. The round ligaments have long been recognized as offshoots or prolongations of the muscular tissue of the uterus, but the muscular tissue of the other uterine ligaments is composed of somewhat disseminated unstriped fiber, is not aggregated into bundles capable of gross postmortem recognition, and has been less long recognized. Its adequate postmortem demonstration has been accomplished only by serial microscopic section and even this involves considerable technical difficulty, hence its existence in any considerable amount has only been fully demonstrated in very recent years.

Even in 1904, when I first attempted its

[1] Read before the American Gynecological Society, May, 1911

study, the anatomical text-books contained but passing references to this unstriped muscular tissue, and, moreover, treated it as unimportant. A personal study made at my suggestion by Dr. W. P. Graves, who was then my laboratory assistant, resulted in but little additional information, and under the pressure of other work was dropped; but the physiological evidence of the existence of such contractility which I had already obtained was considerable and could be explained only by the existence of muscular tissue in considerable quantity; moreover, these muscles and their action are often visible in the course of operations on the living woman, hence my continued interest in the subject.

Since then technical anatomical methods have evidently improved, for when a year ago I began a renewed search of the literature I found that in the six years which had intervened, descriptions of this tissue in quantity to be of functional importance, and in wide distribution throughout the ligaments had appeared in each of five recent text-books examined, and were substantially similar in all.[1]

Muscular tissue then is found sparingly throughout most of the pelvic connective tissue, and exists in especially important quantities in three situations, throughout the utero-sacral ligaments, at the base of the broad ligaments, and along their upper edges. In the base of the broad ligaments it follows in a general way the course of the uterine vessels, but radiates out in widespread insertions along the pelvic wall and into the vault of the vagina and the sides of the cervix. It is here especially abundant. In the upper part of the broad ligaments we find the round ligaments and an almost equally important, though less easily demonstrable, muscular mass which follows the course of the ovarian vessels. The space within the utero-sacral folds contains connective tissue, lymphatics, and much unstriped muscular fiber. Though these three groups of muscular tissue are demonstrable postmortem mainly by serial microscopic sections, their action and even their mass is usually recognizable during life, i. e., during operation, and they are therefore probably familiar to every operator who has given any thought to their existence and importance. Their origins and insertions must be carefully remembered in estimating their action.

In estimating the action of the broad ligaments we must remember that they are narrow at their uterine insertions but are widespread at their origins against the pelvic wall.

At their upper margins the contained round ligaments (or muscles) and the muscular bundles which accompany the ovarian vessels spread widely forward and backward, but must in combination exert a lateral traction. The round ligaments tend to draw the fundus forward. The infundibular or ovarian bundles tend to draw the fundus backward. When these muscles act in combination their resultant is lateral, but the possibility of their individual action must be remembered.

At the base of the broad ligaments the very strong bundles of muscular fiber which follow the uterine vessels spread out into similar fan-shaped expansions and must as a whole exert a similar lateral traction. The resultant of the comparatively unimportant fibers which are scattered throughout the broad ligaments is probably essentially the same.

The utero-sacrals are attached, or their most active part is attached, at about the cervico-corporeal junction. When in joint action their resultant is directly backward, but spasm of one utero-sacral with relaxation of the other (usually in conjunction with spasm of the base of the broad ligament on the same side) is a phenomenon of frequent clinical occurrence, and one which I believe to be of much clinical importance. The possibility of this unilateral action should therefore be borne in mind.

The anterior attachments of the supravaginal cervix are also structures of great importance to the support of the uterus. There is, in fact, a large mass of muscular fiber surrounding and supporting the base of the bladder. These fibers are attached anteriorly to the pelvic walls and posteriorly to the anterior and lateral surfaces of the cervix and vagina.

[1] Buchanan: Manual of Anatomy, 1907, ii, 823.
Sobotta: Atlas and Text-Book of Human Anatomy, 1906, ii, 151.
Piersol: Human Anatomy, 1907, pp. 2005–2007.
Wm. Anderson in Morris: Human Anatomy, 1903, p. 1103.
G. D. Stewart in Gerrish: Text-Book of Anatomy by American Authors, 1902, pp. 2005–2007.

The most noticeable bundles, and their connective tissue accompaniments, have long been described as utero-vesical *ligaments*, but their muscular character has not been sufficiently emphasized. The insertion of the anterior vaginal wall into the cervix is also a uterine attachment of much importance. This wall is largely non-muscular, and is attached at one end to the cervix and at the other to the arch of the pubis.

Argument from comparative anatomy. Much obscurity has resulted from the time honored description of the above essentially muscular structures as uterine *ligaments*. In reality, it is a general zoölogical law which holds throughout the mammalian kingdom that except in a very few instances in which ligaments of elastic yellow connective tissue, such as the ligament nuchæ, are specially provided, all weight bearing structures are composed of muscular fiber, and when the weight bearing function is clonic and continuous during life, they are usually of unstriped muscular fiber. This law is so general and of such universal application that we should be justified in anticipating "a priori" that such would be the character of the uterine supports. It seems to me a strong point in favor of the view which I am presenting that it is not only supported by direct observation of the nature of these structures, but that under its application this universal law is shown to be as true of the so-called uterine ligaments as it is of all the other structures throughout the body and throughout the mammalian kingdom.

Physiological study. Since the uterine supports as we know them exist only in the human female (with some slight foreshadowings in the primates) experimental physiological study of their action is impossible, and we are limited to such observations as can be made in the course of our clinical work and without injury to the patient.

Much more might be gained by the study of these muscular structures in the course of abdominal operations were it not for the fact that these are almost always conducted under full surgical anæsthesia, and that the interests of the patient preclude the waste of time and risk of infection which would be involved in actual experimentation upon the action of these muscles during operations, but something can be learned by an individual observer who watches the action of these structures under the varying degrees of anæsthesia in the course of a long series of operations. His results, though perhaps useful to himself, can, however, hardly be tabulated in such form as would make them valuable for repetition or critical discussion before an audience.

Something in this direction can, however, be done by a comparison of the results of tactile examination upon the same patient with and without anæsthesia, more especially in cases of pathological spasm, and these observations are capable of description in fairly clear form, more especially as the spasm is usually limited to some one muscle (ligament) or group of muscles.

In my own observations three such spasms have seemed especially noteworthy.

Retrocession. If cases of retrocession are observed by rectal or recto-vaginal examination without anæsthesia it is found that a marked feature of the condition is shortening and rigidity of the utero-sacral *ligaments* so-called. This was formerly thought to be organic and its recognition led to the operations for division of the utero-sacrals by vaginal section which were at one time popular, but of which we seem to have heard but little of late. If we conceive of this condition as a spasmodic contraction of the utero-sacral *muscles* we obtain a conception which is much more nearly in accordance with the history of the affection; moreover, if the same patients are examined by the same methods under complete anæsthesia the rigidity and shortening of the utero-sacrals will usually be found to have disappeared, but will reappear after the anæsthesia is withdrawn. An exception to this statement will, however, be found in some cases in which long continued inflammation has resulted in the appearance of an exudate that is incapable of disappearance under anæsthesia.[1]

Lateral displacements of the uterus. This abnormality has been but little noticed, but if any observer will form the habit of noting

[1] In these cases the contracture disappears only after the exudate has been dissipated under more or less long continued minor treatment.

the relation of the uterus to the median plane of the pelvis as a routine step in his vaginal examinations he will soon be struck by the frequency with which it is drawn to one side or the other. Sometimes this contracture affects the fundus only, sometimes the cervix only, but more commonly the uterus as a whole is drawn to one side of the median plane. It has been generally supposed that these contractures were organic and the result of inflammatory shortening or cicatricial contractions. In some cases this is of course the fact, but there are not a few cases in which observations of the same nature under full anæsthesia will demonstrate that the contracture has disappeared, to reappear again when anæsthesia is withdrawn. In the latter class of cases it is difficult to avoid the conclusion that the contracture is spasmodic.

Anteflexion of the body. In many cases in which examination without anæsthesia demonstrates the existence of sharp anteflexion of both cervix and body, repetition of the same examination under full anæsthesia will show that while the cervix is still held somewhat strongly forward the body of the uterus is now to be found in normal position, or even in some slight degree of retroversion, but resumes its former position when the anæsthesia has been recovered from. It seems to me that this phenomenon, which I have observed too often to doubt its existence, can only be due to spasm, the relaxation of spasm, and the reproduction of spasm of the round ligaments and the other anterior muscular fibers of the upper part of the broad ligament during this series of observations.

Further discussion of this particular subject must, however, be postponed to a later stage of the paper, in which anteflexion of the cervix is to be considered at more length.

The question of the cause or causes of these localized muscular spasms is of course vital to their treatment, and to any real comprehension of the subject. It is one which I approach with diffidence. Dr. E. M. Mosher, of Brooklyn,[1] has noted a coincidence between right lateral displacement of the uterus and right lateral asymmetry of the skeleton in twenty-two cases, and attempts to explain the uterine abnormality as the result of unequal intra-abdominal tensions from the resultant asymmetrical way of standing. I have noted this coincidence in a larger number of cases, but the explanation quoted seems to furnish at most only a partial cause, though I think sometimes an important one. I am not yet willing to offer a definite opinion upon this point, but am inclined to believe in the existence of several separate explanations, any one, or all, of which may probably be present in a given case. One of these may be spoken of here. In some cases it appears probable that these spasms are mainly protective spasms, e. g., a spasm of the upper part of one broad ligament is frequently coincident with the presence of an inflamed ovary on that side and may well be an attempt to lessen pain by immobilization; again, spasm of the base of one or both broad ligaments is frequently coincident with retained cervical secretions behind a narrow os, and here it is possible that engorged lymphatics need protection.

No one can be more aware than I of the very inconclusive form in which I am presenting this subject, but I feel that I am not in a position to dogmatize.

My observations upon all these points have been many, having been carried on almost continuously for about eight years, and have covered a large number of cases, but they have been made in the course of clinical work, and many of them have been unrecorded or imperfectly recorded; again, in going over those which I have written out at the time they were made I have found that the expressions used were necessarily so indefinite, so comparative, owing to the varying amount of relaxation observed in different cases, that it has seemed to me that their tabulation in statistical or any other form would have but little real value. I believe that it is safer and more in accord with scientific caution for me to merely report my conclusions, en masse, and as only the opinions of one observer after eight years of study; to be then confirmed or disproved in whole or in part in accordance with such observations as others

[1] E. M. Mosher: Habits of Posture a Cause of Deformity and Displacement of the Uterus. Woman's Medical Journal, Cincinnati, December, 1910.

may care to make upon this subject in the future. The phenomena which I have described have, however, seemed to me so clearly noticeable that I have no doubt that there are many others here present who are familiar with them.

The application of a partially proved hypothesis to a fresh group of facts with which it is found to accord is always, moreover, an added proof of its validity, and this method may be used here in considering the clinical importance of spasm of the uterine ligaments in relation to the symptomatic results of anteflexion of the cervix.

Conpubertal anteflexion of the cervix. Anteflexion of the cervix has long been described as an abnormal shape of the uterus and the result of an underdevelopment, i. e., of a partial persistence of the antepubertal condition of the organs. The corresponding underdevelopment of its attachments to the surrounding structures has been usually overlooked.

That many cases of marked anteflexion of the cervix are unattended by symptoms is well known; that other cases often less extreme are associated with sterility and dysmenorrhœa, and are probably etiologically so associated, is well known.

The conclusion to which I have been forced, that this abnormal shape of the uterus is frequently much exaggerated by spasm of the muscular supports of the uterus, and that cases with habitual spasm have symptoms while those without it are usually free from symptoms, is so far as I know unrecognized in the literature of the subject.

These several points I now wish to develop.

In relation to the subject of anteflexion it is important to note in more detail the underlying anatomical points, and their variations from the normal. First, then, it must be remembered that the mass of unstriped muscular fiber which underlies the base of the bladder is attached posteriorly to the vault of the vagina and the supravaginal cervix and anteriorly to the descending rami of the pubes. Second, that the more important part of this muscle is inserted at the vault of the vagina into the anterior vaginal wall, which is itself normally attached to the cervix at a point much lower than the utero-sacral muscles which oppose it, and in cases of conpubertal anteflexion is usually attached to the extreme tip of the cervix. Third, an all important point is that in this developmental anomaly the anterior vaginal wall is also uniformly underdeveloped, i. e., is short and usually narrow, and that this wall is a strong structure which in the non-pregnant state is mostly composed of white connective tissue, and which is attached firmly by its lower and forward end to the tissues about the descending rami. Fourth, that the fundus of the uterus is held forward, as has been pointed out, by structures which are almost exclusively muscular. Last, that the uterus itself is not a rigid, but a muscular and therefore elastic body, which is capable of an increasing or decreasing flexion under the play of the surrounding forces.

If these points are borne in mind it will be seen at once that the small, pointed, and anteriorly deformed cervix is not only structurally held forward by the short anterior wall and its attachments, but that any irritation which results in a spasm of the mass of muscles which is usually summarized under the name of the utero-vesical ligaments must result in an increase of this forward deformity; that owing to the attachment of the utero-sacrals to the uterus at a point above the attachments of these anterior muscles, whenever a spasm of the utero-vesical (or more properly pubo-vaginal) muscles is opposed only by a spasm of the utero-sacrals, unparticipated in by spasm of the round ligaments, the couple (to use mechanical language) so formed must result in a tendency to backward displacement of the upper pole of the uterus, the fundus; while if the round ligaments are also in spasm a double couple is produced and results in increased anteflexion of both cervix and body. These theoretical conclusions from known anatomical facts certainly correspond with the clinical observations of which I have written above.

They also offer an explanation of the relations of anteflexion of the cervix to dysmenorrhœa, sterility, and the production of retroversion, in cases associated with this form of anteflexion, of which I now wish to speak.

Dysmenorrhœa in anteflexion of the cervix. If it be true that in the cases in which anteflexion of the cervix is associated with dysmenorrhœa this alteration in the shape of the organ is partly the result of an organic (developmental) vice of shape, and partly the result of an exaggeration of that vicious shape by spasm of the muscular supports of the organ, it is necessarily true that even during the intermenstrual interval there would be some approach to an obstruction of the lumen of the utero-cervical canal, such as is produced by making a sharp bend in a rubber tube, and still more true that with the approach of the catamenial congestion, which increases the tension within the uterine walls, this obstruction of the lumen would be of necessity and mechanically increased. Intermittent or constant partial obstruction of the menstrual flow would therefore exist even in a canal which readily permits the passage of a uterine sound, and this would go far to explain the dysmenorrhœa; but it is not wholly necessary to invoke this obstructive condition, for throughout the body pressure is pain, and increased pressure must of necessity exist at the point where a tube is bent upon itself.

In some cases at least this point may be an adequate explanation for a part or all of the catamenial pain in the condition which has so long been described as obstructive dysmenorrhœa.

Sterility in the same cases. When anteflexion of the cervix is associated and perhaps etiologically associated with sterility, it is possible that the mere obstruction of the lumen of the cervical canal due to the congestion and spasm of the intrapelvic muscles, which probably forms a part of the act of coitus, may in itself be a cause of the sterility, but in my experience sterility is almost always associated with a greater or lesser alteration of the cervical or other genital secretions, and in cases of anteflexion of the cervix is almost always associated with dysmenorrhœa. It therefore seems to be more probable that the sterility so often found in these cases is a result of alterations in the condition of the endo-cervical mucous membrane caused by partial retention of the catamenial flow, and of the intermenstrual secretions of the uterine cavity, rather than that it is merely a mechanical matter.

Retroversion as a result of conpubertal anteflexion of the cervix. A priori, if the foregoing conclusions hold true, i. e., if in anteflexion both poles of the uterus are held forward by structures which are liable to muscular spasm, while the cervico-corporeal junction is held backward by the utero-sacral muscles, thus increasing the vicious curve; if it is also true that this increase of the vicious curve is resisted by the intrinsic musculature of the uterus; and, further, that the structures which hold forward the fundus are more exclusively muscular, more capable of complete relaxation than those which hold forward the cervix, it would follow that with relaxation of spasm the backward movement of the fundus would be greater than that of the cervix; but movement of the fundus backward while the cervix stays forward is of necessity a tendency towards retroversion.

It would also hold true, a priori, that if the structures which hold the cervix abnormally forward are organically, i. e., developmentally, shortened, any considerable motion of the uterus such as results from forced use of the abdominal muscles, or from falls or other accidents, would be exerted chiefly upon the fundus, which is subject to the normal freedom of movement while the cervix is abnormally fixed; i. e., there would again be an inevitable tendency towards the production of retrodisplacements from slight causes.

Experimentally I have made many observations in which a fundus which was held forward in normal position, or even in anteflexion of the body, when the patient was examined without an anæsthetic has been found to have moved backward into normal position, or even into straight retroversion, during the production of anæsthesia; but has been found in its original position after recovery from anæsthesia, although it had been interfered with in no other way.

I have also seen a large number of cases of retroversion of a straight uterus, in which the re-position of the body was unattended by movement of the cervix, so that after the re-position the typical condition of ante-

flexion of the cervix existed, although when I first saw the case it had appeared to be a straight and movable retroversion.

In past years I have seen a number of cases in which an operation for the correction of such a retroversion for such symptoms as backache, nervousness, abdominal discomfort, etc., resulted in the reproduction of a dysmenorrhœa from which the patient had previously suffered, but which had been absent or easier during the years in which retroversion had probably existed.

I have in several instances had the opportunity of watching the whole process of the development of a retroversion out of an anteflexion of the cervix, and will briefly report one such case.

Private records. B. 2724. Patient of Dr. C. P. Putnam. Consulted me in April, 1907, complaining of severe headache and moderate abdominal pain of four to five days' duration beginning about two days before the catamenia and resulting in about a week's prostration after it. On examination she had a moderate anteflexion of the cervix but nothing else abnormal. As she was complaining of eyestrain, she was sent to an opthalmologist, and was requested to report after receiving his opinion. She was not seen again for three years, but in April, 1910, she reported that her symptoms had gradually increased in intensity. On examination the cervix was still in anteflexion, the fundus was drawn strongly to the right side and somewhat backward but under anæsthesia resumed a normal position. After recovery from anæsthesia it was again to the right and backward. In view of the fact that she was about to marry she was given only depletive treatment and advised that pregnancy, if it should occur, was the best possible treatment of the condition. Ten months afterwards, in January, 1911, she reported that her dysmenorrhœa had become worse immediately after marriage and had steadily increased since that time. The postcatamenial depression now extended to within a week of the succeeding period. On examination the cervix was anteflexed, the uterus retroverted and drawn as a whole to the right side. There was considerable tenderness in the region of the right ovary.

She was advised operation to consist of the vaginal plastic, to be spoken of shortly, and of an abdominal incision. At operation the right ovary was found moderately enlarged, cystic, and edematous. It was resected, the appendix removed, and the fundus suspended.

It is too soon to report results though they are so far good.

For now nearly three years I have made it a practice to observe the shape and degree of forward attachment of the cervix in every case of retroversion. I have found evidence of some degree of anteflexion (or, as I prefer to call it, conpubertal forward fixation of the cervix) in a large proportion of my cases of retroversion. I have thought it probably of etiological significance in between 10 and 20 per cent, of those in which it was present, but it would require a very large number of cases to establish a percentage of any real value upon this point.

At the beginning of this period I adopted the practice of performing a plastic for correction of the forward fixation of the cervix as a preliminary to operations for retrodisplacement in those few cases in which the maldevelopment of the cervix existed in very high degree. I became satisfied that the results of my operations were better both anatomically and symptomatically after the adoption of this habit, and with each succeeding year have performed this little preliminary plastic in a larger proportion of cases.

The number of cases in which I have performed the conjoint operation is, however, still small, both because it is applicable at most to only a percentage of retroversions, and on account of the conservative method of selection of cases which I have practiced. I have records of sixteen such cases, of which eight have been performed during the last year, but the position and movability of the uterus, and so far the symptomatic relief to the patients, have seemed to me so much better than in similar previous cases in which I have not preceded the abdominal operation by correction of the cervical position that I now intend to perform it much more freely.

The operative procedure which I have adopted for the treatment of anteflexion of the cervix is simple in plan, and if carried out with due attention to its principles has proved very effective in use, but careful attention to two details is essential.

After a preliminary dilatation and curettage the length of the cervix from the external os to the point of flexion is carefully measured and the posterior lip of the cervix is divided with scissors in the median line up to this

point. The angle between the line of the cut and the edge of the external os on each side is then sutured into the extreme upper end of the cut after the manner of Dudley's method of discission of the cervix, although I have habitually used two sutures, one on each side, in place of the somewhat complicated single suture which Dr. Dudley originally described.

The attainment of the actual angle of flexion by both cut and sutures is the first essential point in the operation.

The anterior lip of the cervix is then seized by a volsellum and drawn strongly backward, putting the anterior wall sharply on the stretch. The vaginal wall is then divided transversely with the knife just in front of the cervix, the cut being usually just wide enough to admit a finger, and carried completely through the vaginal wall with knife and scissors, exposing the bladder. The finger is then passed into this cut and the bladder freed from the vagina and cervix well up along the anterior surface of the uterus. A similar blunt dissection with the finger separates the anterior attachments of the vault of the vagina and base of the bladder, well out to each side.

That this separation should be made laterally extensive, and also carried above the angle of flexion is the second essential point in the operation.

The edges of the vaginal wound are then brought together by transverse sutures, nothing but the vaginal wall being included in their grasp, thus elongating the anterior vaginal wall. There is usually somewhat profuse bleeding from the divided vaginal wall. If the blunt dissection is done with reasonable skill there is no other bleeding.

There are few, if any, cases of anteflexion of the cervix in which this little operation is not a radical anatomical corrective, and in its use for dysmenorrhœa and sterility I have a long list of cases.

In those cases of obstructive dysmenorrhœa which are associated with anteflexion of the cervix I think that it has yielded more permanent symptomatic results than any other procedure that I have used.

When careful examination has led me to believe that sterility was dependent on partial retention of secretions within the cavity of an anteflexed cervix I have had a large percentage of success.

I have already stated my opinion that it is a procedure which is well worth while in all cases in which a retroversion is associated with a forward fixation of the cervix.

THE END RESULTS WHEN HYSTERECTOMY HAS BEEN DONE AND AN OVARY LEFT[1]

By JOHN OSBORN POLAK, M. D., M. Sc., Brooklyn, New York
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MUCH has been written in the last few years upon conservatism in pelvic surgery. The two classes of pelvic surgery to which conservatism may be applied clinically are pelvic inflammatory lesions in the subacute or chronic stage, after nature and time have protected the patient by peritoneal adhesions and their absorption has taken place, and fibromyomata of the uterus.

In the former class, the great mass of clinical evidence contributed in this country by A. P. Dudley, Clark, Norris, Peterson, Hyde, Robb and the writer show:

First, that the end results of salpingostomy are unsatisfactory and that resection and phimosis operations are followed by useless, painful, and occluded tubal ostia, and that cases of inflammatory tubal disease should be subjected to a. long period of preoperative treatment, before any surgery is done, except the drainage of acute pus collections in the pelvis; by attention to this detail, many ovaries and tubes will be saved, particularly

[1] Read at meeting of American Gynecological Society, Atlantic City, May 23-25, 1911.

when the gonococcus is not a participant in the infection.

Second, that whenever it is possible to save healthy ovarian tissue, however small in amount it may be, it should be done, provided this can be accomplished without interference with the ovarian blood supply by misplaced ligatures and sutures.

It has further been shown in the work of Clark, Norris, and Peterson, that when it is necessary to remove the uterus, one or both ovaries should be conserved if possible, in order to mitigate the nervous symptoms of the artificial menopause.

It is my purpose in this brief contribution to analyze and tabulate my clinical results in a series of 132 abdominal hysterectomies, in many of which one or both ovaries, or a part of an ovary, have been conserved, and compare these results with a like number of patients subjected to hysterectomy and double salpingo-oöphorectomy.

In investigating these end results, the comparison will be made on the following points:

First, the general health of the woman after the operation.

Second, the severity of her nervous symptoms and their duration.

Third, the amount of pelvic pain or freedom from pain following conservation, as compared with the comfort of the patient after complete extirpation.

Fourth, the condition of the conserved ovary, or of the part of the ovary retained, at the time of the final examination.

I have selected for this analysis, only cases which have been operated since January 1, 1906, as prior to this time the technique of the operation performed differed in many details from that since employed.

The points of difference were: First, the level at which the uterus was amputated in the supracervical procedure, second, the disregard of ligamentous suspension of the cervical stump, and finally, the position in which the conserved ovary was placed. Later experience has shown that attention to these details has done much to make my patients free from pelvic pain.

For the past five years our technique has been as follows: The uterus is removed well below the internal os, between clamps, the vaginal portion of the cervical stump is coned out with spud or scissors, care being taken to excise the cervical mucous membrane down to the external os and cauterize the canal. This cures the persistent endocervicitis which so often proves intractable after hysterectomy.

When the uterine and ovarian arteries have been tied, the round and broad ligaments are sewn into the cervical stump, raising it high in the pelvis, and the utero-vesical fold of peritoneum is brought over the line of suture and sewn to the peritoneum of the utero-sacral ligament at their point of insertion into the cervical stump.

The conserved ovary or ovaries are lifted up and sutured to the posterior surface of the round ligament, about an inch and a half from the internal abdominal ring, and so placed between the round and broad ligaments as they converge toward the cervical stump, that the raw surfaces of, and ligatures on the ovary are turned into the pouch thus formed. This places the ovary in such a position that adhesions are not likely to occur.

We have noted, however, that the slight torsion which placing the ovary in this position makes on the pedicle, with its contained ovarian artery and vein, is sufficient to temporarily engorge the ovarian structure. This interference with the blood supply has not seemed to leave any permanent change in the ovary, provided the gland or the part of the gland retained contained healthy ovarian tissue, or unless the suture of the resected ovary had been defective; yet the observation is significant, suggesting the possible subsequent behavior of ovarian tissue when there is an interrupted venous outflow.

In a paper before the American Medical Association in 1909, the writer called attention to his method of suturing ovarian tissue in resection, and showed that too tight application of an ovarian suture was a cause of failure in ovarian resection, by interfering with the blood supply, and causing cystic degeneration of the conserved ovary.

Peterson, Clark, and Norris have shown in their series of hysterectomies, that one or part of one or both ovaries should be left,

to avert the severe symptoms of the artificial menopause, unless contraindicated by the diseased condition of both ovaries, or the advanced age of the patient. They further state that in seventy-nine per cent of the cases, the menopause does not appear until 45 years of age. We will show in this series, that our most severe neuroses have occurred in women past fifty, and we doubt from comparison of our statistics, that there is any advantage in leaving the ovary for its internal secretion in a woman who is at an age when the menopause should have occurred. In this observation we are at variance with Clark and Norris. In this series, fifty per cent of the ovaries associated with fibromyomatous growths of the uterus were diseased, and allowed of no conservative treatment.

Analyzing the case histories of the hundred and thirty-two hysterectomies which form the basis of this report, we find that ninety-six were done for fibromyomata of the uterus, thirty-one for pelvic inflammatory disease, which involved the uterus, ovaries, tubes, and pelvic peritoneum, three for malignant disease of the womb, and one for arterio-sclerosis.

The age at which these women presented themselves for radical operation ranged from 21 to 59. Between these limits there were six who were under 30, fourteen who were between 30 and 35, twenty-nine between 40 and 45, twelve between 45 and 55, while one patient was over 55 at the time of her operation.

In the ninety-six women who were subjected to total uterine extirpation for fibroid disease, both ovaries were removed in 48 or 50 per cent, while one, a part of one, or both ovaries were conserved in an equal number. This affords an excellent basis for the comparative study of the end results, notwithstanding that the number of patients are two few for us to draw positive conclusions. Of the total number, two died, one from diphtheria, one from pneumonia, nineteen have been lost track of, and there is no available record, except that of the condition present at the time of their discharge from the hospital. Seventy-five, however, have been followed and accurate notes have been kept of their general and local condition for periods varying from a few months to nearly five years.

These observations show that forty-three in whom total extirpation of the uterus and adnexa was done, are free from all pelvic pain or symptoms referable to the pelvis, except lumbo-sacral backache, which was present in eleven, and which has been completely relieved by proper corseting. The bimanual pelvic exploration demonstrates the cervical stump to be high in the pelvis and freely movable, the broad ligaments and pelvic peritoneum free from exudate. In none is there any eversion of the vagina, which instances how well the ligaments support it, when sewn into the cervical stump. Three suffer from flushes, one from marked nervous phenomena, while thirty-nine, or over ninety per cent, enjoy perfect health.

Of the thirty-two women in whom an ovary, both ovaries, or a part of an ovary was conserved, five complain of pelvic pain referable to the site of the retained ovary. This ovary, on examination was found to be enlarged, tender, and somewhat fixed by adhesive inflammation. Three of these women suffer from nervous phenomena which have apparently increased as the local condition of the ovary has shown further pathologic changes. The four women, one in the complete, three in the incomplete class, in whom the nervous symptoms are so prominent, are all over fifty years of age. The last three women could not be in any worse condition had a total ablation been made. This structure at the time of operation was considered healthy upon macroscopic examination.

Contrasted with this series, we find thirty-one women who were subjected to the radical operation for the results of pelvic inflammatory disease, owing to changes which had taken place in the adnexa. In only one were we able to conserve an ovary. One death occurred, leaving thirty in whom we may study the existing clinical conditions. Twenty-eight are at this writing in perfect health, complaining of no nervous symptoms of any kind, time, heat, and boroglyceride having dispelled the pelvic exudates which followed operation at the drainage site, etc. One suffers from flushes which recur at varying intervals and seem dependent upon the condition of her general health. All were under

forty at the time of operation. The only patient in whom an ovary was conserved has occasional pain at the site of the retained ovary, but has no nervous distress.

We have observed that the severity of the nervous symptoms is less subsequent to the operation, and the general health of the woman better, when a hysterectomy has been performed for pus conditions in the pelvis, than when the uterus has been removed for a fibromyoma. This we believe is explained by the fact that for a long period prior to operative intervention the woman has suffered an absorption, The woman is more or less an invalid from constant pelvic irritation which undermines the nervous system, from the suppurative focus which results in a degree of septic intoxication. When this is relieved by the removal of the uterus and its adnexa, she is permitted to attain a more perfect state of health, by allowing her emunctories to functionate normally, and her nervous state improves proportionately, for in all of this class the nervous symptoms tend to disappear as the patient regains her general health.

A similar observation has been noted in reference to cases of fibromyomata where the hemoglobin and red cell count is very low, operation checks the blood losses and the recovery is prompt and free from nervous annoyances, when the patient is placed in proper environment, consequently, we deduce that the nervous phenomena are more severe when the woman is operated on when she is in comparatively good health, because the operative menopause comes as a greater shock than when the blood picture shows anæmia and toxic products.

We have further noted, that when the ovary has been retained and is pathologic or involved in an exudative mass, that the woman is prone to show exaggerated menstrual molimena, often more severe than characterized the nervous symptoms at the menstrual epoch, prior to operation. Two of my patients now under observation have violent gastro-intestinal attacks, associated with severe headache at the time that the menstruation should occur. The presence of the ovary in these two patients has seemed to irritate rather than alleviate the nervous reflexes.

A study of the blood picture prior to operation, while limited to a few cases, has seemed to show definitely that when the patient has been the subject of profuse or constant hæmorrhages, reducing hemoglobin percentage and red cell count to below fifty and 2,500-000 respectively, even though the ovaries were both removed, the patient has seemed to be free from nervous phenomena, save for a few flushes in the early part of her convalescence. The blood pressure before and after operation in many of these cases, points to the fact that the nervous phenomena are worse when the blood pressure is high prior to operation. In cases which have manifested the most severe symptoms, the blood pressure before the operation varied from 150 to 240 millimeters, evidencing a toxicity or an arterial sclerosis. Operation made no change in the blood tension of these vessels, and the surgical menopause was stormy until the arterial tension was reduced. when the flashes and other nervous symptoms began to disappear.

From this study we would conclude:

First, that the technique of the operation and the general health of the patient has much to do with the end results.

Second, that a conserved ovary if unhealthy will leave the patient in a worse state mentally, nervously, and physically, than if a total extirpation had been made.

Third, that when the woman is at the age at which the menopause should occur, or when she is past the menopause, a total ablation gives the best results.

Fourth, that the nervous phenomena are more marked when the patient is operated when she is in comparatively good health, with a high preoperative blood pressure than when the blood picture shows anæmia ,or toxæmia.

Fifth, that the symptoms of the operative menopause are less after extirpation for pelvic inflammation, than when the ablation is done for fibromyomata, this is probably due to the associated vessel changes which we find in fibrosis.

And finally, that when one or both healthy ovaries can be conserved it should be done; the younger the patient the more necessary is conservation.

IS THERE ANY CLINICAL OR EXPERIMENTAL PROOF THAT THE OVARY HAS AN INTERNAL SECRETION?[1]

By W. H. MORLEY, M. D., Detroit, Michigan

THE internal secretion of the ovary has held the attention of clinicians and scientists for many decades. Interesting as this subject is from an historical standpoint, the short time allotted will permit but a short résumé. The ingestion of fresh animal tissues was a therapeutic agent well known to the ancients. The older medical writers, like Pliny and Galen, mentioned its efficacy. Ovarian organotherapy was used and advocated by the medical writers of the middle ages. It was not, however, until the time of Brown-Sequard that attention was called to the fact that there might be some active principle locked up in the gland. From his researches with testicular extract, Brown-Sequard was able to formulate a law, which has justly been called "the cornerstone of the doctrine of the internal secretions." This law was as follows: "All glands, provided or not with secretory ducts, give to the blood useful principles, whose absence is felt after their extirpation or their destruction by disease." Later researches and clinical data have changed this law of Brown-Sequard's in some of its minor details, but the fact remains that many of the ductless glands, like the thyroid, adrenals, pituitary, spleen, and the ovary have a certain definite function, which consists in producing a certain definite and specific substance and in secreting it. The substance passes into the circulation and influences the various cells of the body in its own peculiar way. Spencer, in speaking upon this question, says:

"There exists between the single cell groups an altruistic relation in such a manner that each cell group undertakes a definite duty for the other cell groups, even so as all the remaining for the one. Such a change of all the remaining cell groups follows the change of one cell group and in such a way that an altruistic hypertrophy follows a progressive change, an altruistic atrophy, a retrogressive change." Important and interesting as is this question of the reciprocal action of the glands with an internal secretion, time will not permit its further discussion.

Shortly after the experiments and reports of Brown-Sequard, the scientific world commenced to report its experimental and clinical results with ovarian extract. It had long been observed, clinically, that upon a natural cessation of the menses, or upon cessation due to castration, a series of disturbances appeared, which were principally expressed in, or referable to, the nervous system. After the remarkable results with extract of the thyroid an attempt was made to see if an analagous cure could not be found in dried ovarian substance for disturbances of the climacteric, both physiologic and artificial. The literature is rich with clinical reports in which an ovarian extract of some sort has been tried. The results have been varied.

I cannot refrain from taking a moment of your time to speak upon the question of the preparation of ovarian extract. It is a most important matter, as faulty preparation will often destroy the active principle, whose form is yet unknown, and invalidate clinical and experimental observations. Fresh glandular tissue is a most delicate substance and requires the most careful handling. Extremes of heat and cold, strong chemicals, et cetera, will soon render the product, per se, inert. In writing on the subject, a well known authority (Hansemann) says, "If one knows the specific and active material of the glands and if one can isolate it chemically pure, and in consequence, determine and measure with clinical exactness its therapeutic value, as is the case with the active principle of the adrenals, one will prescribe the pure substance, rather than the entire gland. But if the active principle is not to be obtained in a pure state, and that is the case with most of the glands, then the use of fresh organic material of recently

[1] Read by invitation at the Annual Meeting of the American Gynecological Society, May, 1911, at Atlantic City.

slaughtered animals offers the best qualifications." This same author, in speaking of the form of the extract, says that a fluid extract, whether aqueous or glycerinated, is not entirely free from objections. One is not always sure that the active principle, qualitatively and quantitatively, passes completely over into the solution. The dried and powdered product, properly prepared, produces the best results in most cases. It contains all the active material of the organs in question and allows a fixed dosage. Until the active principle of the internal secretion of the ovary is isolated, the dessicated product will be the form most used.

One of the earliest clinicians to use ovarian extract in disturbances of artificial or natural menopause was Robert Mond in the clinic of Professor Werth in Kiel. His results were so satisfactory that they encouraged a continuance of the treatment. The conclusions of Mond were verified by Chrobak, Jayle, Mainzer, Laudau, Martin, and others. The brilliant results of these clinicians with ovarian extract would seem to justify the conclusion that it has, or exerts, some specific action against the annoying disturbances of artificial or physiologic menopause.

The next step was an attempt to determine just what it was the ovary elaborated, lack of which was felt after their removal, or atrophy. Much good research work has been done in an endeavor to locate and determine the active principle of the ovary. Some investigators have said it was produced by the ovary as a whole, a few that the active principle was elaborated by the yellow body, or corpus luteum.

The human ovary may be roughly divided into a central portion, or medulla, and a cortical portion, this latter again subdivided into the epithelium, the frame work, and the Graafian follicles. These latter rupture, let out the ovum, and the cavity fills with blood, forming the so-called corpus hæmorrhagicum. This latter body organizes as any other blood clot and by the later deposition of lutein in the cells, a corpus luteum or yellow body results.

It might not be out of place at this point to explain the terms so often confused, i. e., the

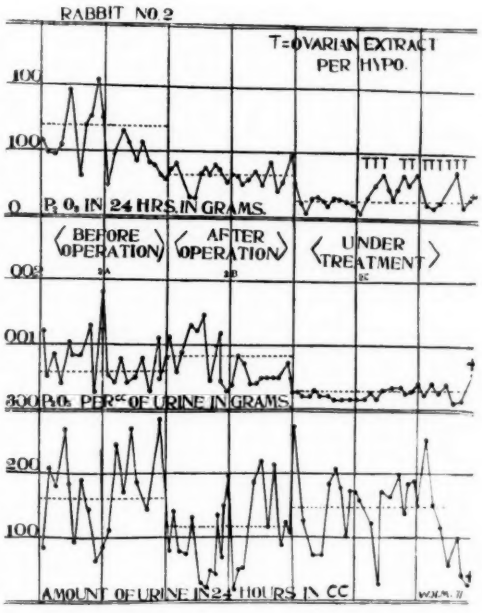

CHART NO. 1.

Here is shown the effect of the internal secretion of the ovary (corpus luteum) upon body metabolism, i. e., the excretion of the phosphoric anhydride (P O) through the urine. The amount of P O eliminated was less after castration and still less under treatment, i. e., injection of an emulsion of dessicated corpora lutea (ovarian extract) per hypo. This latter fact was due to the employment of an old product, which was probably inert due to faulty preparation.

corpus luteum verum and the corpus luteum spuriosum. The difference is one of degree and not of kind. The corpus verum, the true corpus luteum, or the corpus luteum of pregnancy, is larger and does not disappear or degenerate into a corpus albicans until about the eighth month. The corpus luteum spuriosum, the false corpus luteum, or the corpus luteum of menstruation, is smaller and changes into a corpus albicans in about four weeks.

Sobotta concludes that the yellow body, or corpus luteum, is not simply a fibrous plug, but a glandular organ, for the following reasons:

1. It develops at the expense of the follicular epithelium, and not, as some think, from the connective tissue envelope of the follicle. It is then of epithelial origin, a pre-

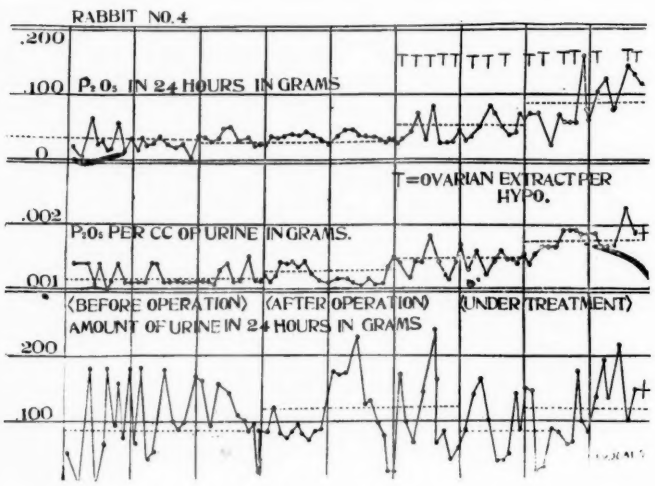

CHART NO. 2.

The results on Rabbit No. 4 differ from those on Rabbit No. 2 (Chart No. 1). This can be explained by the use of a freshly prepared product. The amount of P O excreted after castration was less than before operation. Under treatment the amount excreted was greater than before operation.

sumption strongly in favor of its glandular nature.

2. The glandular character of the cells is explained by the presence in their cytoplasmic bodies of particles, yet unknown, and by the reticulated state of the cytoplasm in the presence of these particles.

3. Finally, according to Prenant, the cells of the yellow body, completely developed, only exceptionally show mitoses; they almost never divide.

According to the brilliant researches of Frænkel, the corpus luteum is a gland with an internal secretion. He attributes to this organ the function of furnishing the impulse of nutrition in a cyclical way to the uterus, which impulse keeps the uterus from retrogressing in youth or from progressing in old age. Further, the uterus is to be prepared by the activity of the corpus luteum for the reception of the impregnated ovum. This last is brought about by the internal secretion elaborated by the corpus luteum. If the ovum is not impregnated, then the secretion acts to bring on the menses. The functions of the corpus luteum, according to Frænkel, are: First, the preparation of the uterine mucosa for the reception of the fertilized ovum, and second, to usher in the menses.

The dessicated corpus luteum has not been extensively used clinically. Lebreton employed it in disturbances of pregnancy. He reasoned that the so-called disturbances were occasioned by an autointoxication, which was caused by a functional insufficiency of the corpora lutea. He dispensed the dried product in doses of 0.5 grams b. i. d. to pregnant women, who complained of nausea, vomiting, attacks of suffocation, palpitation of the heart, and congestion. The result was shown by an immediate cessation of the vomiting, while the other troublesome symptoms were rapidly ameliorated and a complete cure followed in all patients in fourteen days. Drevet used an extract of the corpora lutea which was especially prepared by himself, and reported his results in thirty cases. His conclusions were as follows:

1. The yellow body is that part of the ovary which appears the most active from a therapeutic point of view.

2. Organotherapy with the yellow body alone gives as good results as that obtained with the extract of the entire gland.

3. The dose of the extract of the yellow body administered is always infinitesimal as compared with the medium doses of ovarine ordinarily prescribed; this statement is in accordance with the idea that the yellow body contains the active principle of the ovary.

4. The symptoms subject to the most improvement are, on one hand, dysmenorrhœa, and on the other, the reflex troubles of a nervous and congestive order.

Many scientific monographs have appeared reporting the effect of the internal secretion of the ovary upon body metabolism. It was early discovered, in observations on man and animals, that castration caused an excretion of phosphorus in the urine less than existed before the operation. To prove this and also at the same time, by its proof, to obtain a method of standardizing the product, fifteen experiments were undertaken by the writer on female rabbits.

Each rabbit was placed in a cage suitable for collecting urine. The twenty-four hour amount was collected every morning at 7 o'clock and measured. The amount of food the animal ingested during the twenty-four hours was carefully weighed, the amount of water drunk carefully measured, and all the results recorded on an especially prepared chart. The usual qualitative tests, such as color, reaction, specific gravity, the presence or absence of albumin, sugar, or bile, et cetera, were made and the results recorded. Quantitative tests were made for phosphorus by the uranium acetate method. The amount was also recorded. This was the usual daily routine with every twenty-four hour sample from every rabbit, and this was kept up for three or four weeks. Then the animal was castrated and another series of experiments undertaken exactly as before and the daily results recorded in each instance. After three or four weeks, the animal was injected daily with a freshly prepared extract and the third series of experiments commenced.

In brief, from the experimental reports, from the clinical investigations, and from the anatomical and histological data gleaned from the literature and from personal experience, the following tentative conclusions seem justifiable:

1. The ovary possesses an internal secretion.

2. The internal secretion is produced by the corpus luteum.

3. In so-called ovarian insufficiency, relief may be obtained with an extract of the corpus luteum.

4. No untoward symptoms result from its use in conditions where it is indicated, even if no relief is obtained.

5. The extract should be properly prepared and given a fair trial before it is discontinued.

The subject of the internal secretions is a large one and one upon which a great amount of research work must still be done. The active principle of the ovary is not yet isolated. It is to be hoped that further experimental and clinical observations will clear up many points that are still unexplained.

REFERENCES

BROWN-SEQUARD ET D'ARSONVAL. Archives de physiologie, 1891, p. 491.

CHROBAK. Centralblatt für Gynækologie, 1896, No. 10.

DREVET. These de Paris, 1907.

FRÆNKEL. Archiv. für Gynækologie, 1904, lxviii, heft 2, p. 468.

HANSEMANN. Berliner klinische Wochenschrift, 1900, pp. 135–147.

JAYLE. Revue de Gynecologie, 1898, p. 649.

KRUSEN. Johns Hopkins Hospital Bulletin, Baltimore, 1901, pp. 213–215.

LANDAU. Berliner klinische Wochenschrift, 1896, xxxiii, p. 557.

LANDAU. Verhandlungen der Berliner medizinische Gesellschaft, 1897, xxvii, part 2, p. 182.

LEBRETON. These de Paris, 1899.

MAINZER. Deutsche medizinsche Wochenschrift, 1896, xxii, No. 12, p. 188, No. 25, pp. 393–396.

MARTIN. Sammlung klinischer Vortræge, 1899.

MOND. Munchener medizinische Wochenschrift, 1896, pp. 314, 837.

MORLEY. Detroit Medical Journal, 1909, ix, No. 8, p. 277.

MORLEY. The Journal of the Michigan State Medical Society, 1909, viii, No. 11, p. 524.

PRENANT. Revue medicale de l'est, Nancy, 1898, No. 13, p. 385.

SABOTTA. Archiv. für mikroskopische Anatomie, xlvii, 1896.

MEMBRANEOUS PERICOLITIS[1]

By H. S. CROSSEN, M. D., St. Louis, Missouri

SOMETIMES when we operate for serious symptoms supposed to be due to appendicitis, we find that the appendix is practically normal. I say "we" on the supposition that I am not entirely alone in this respect. In such a case the exploration is naturally extended to the right tube and ovary, as the structures next most likely to give localized disturbance in this region. Occasionally the trouble which was supposed to be appendical is found to be adnexal, and, vice versa, occasionally the trouble which was supposed to be adnexal is found to be appendical. However, it is not with either of these that I am now concerned, but with an entirely different class. Suppose it is found at operation that the troublesome symptoms are due neither to the appendix nor to the adnexa—then what?

In some of these patients the deceptive disturbances are caused by an abnormal condition about the cecum and ascending colon, which condition, for want of a better term, is designated as "membraneous pericolitis." It is these cases, rare but troublesome, that I wish to bring before you briefly for discussion. They are troublesome, and therefore interesting, in two particulars—first in regard to diagnosis and, second, in regard to treatment. Whether or not this condition shall become finally established as a definite pathologic entity, its clinical recognition and correction is undoubtedly important, and marks the difference between success and failure in the operative treatment of these patients.

My first experience with "membraneous pericolitis," so-called, was last December, in a patient operated on for persistent and serious symptoms which I supposed to be due to chronic appendicitis.

Case 1. Mrs. A. A. S., aged 40, referred to me by Dr. E. L. Hill, of Percy, Illinois. For four years the patient has had pain in the right lower abdomen, coming on in attacks lasting three or four days. The pain is not associated with menstruation, and is not accompanied by any decided menstrual disturbance or other distinctive pelvic symptoms. There is chronic constipation, which had been present all her life but which has been much worse since the onset of painful attacks. During the last few months the patient has suffered almost continually with pain and gas in the right side. Examination reveals tenderness all over the right lower abdomen, extending downward into the adnexal region and upward along the ascending colon, most marked, however, in the appendical region. There is some thickening in the cecal region. While the symptoms and signs were not typical of appendicitis, they were such as are frequently found accompanying affections of that structure. I supposed the trouble to be chronic appendicitis, either alone or associated with an adnexal lesion.

On opening the peritoneal cavity by the usual appendical incision, the appendix was found practically normal. Investigation of the right adnexa showed nothing to account for the symptoms. Investigating the cecum further, in the endeavor to find some cause for the disturbances which had rendered the patient an invalid, I noticed what appeared to be some old adhesions on the cecum some little distance above the base of the appendix. A small part of the omentum was found fastened here by an adhesion. Following this upward there was gradually exposed the condition shown in Fig. 1. This I recognized at once as the condition so well described by Dr. Jabez N. Jackson,[1] under the term membraneous pericolitis, and I was able to demonstrate clearly to the assistants and visitors the veil-like membrane, with its longitudinal vessels, overlying the upper part of the cecum and the adjacent portion of the ascending colon. The membrane arose from the abdominal wall, where it was rather thick, and became gradually thinner as it spread out over the adjacent colon. This area of the colon was, by the membrane, restricted and immobilized sufficiently to interfere with peristalsis and to cause more or less difficulty in the passage of gas and feces.

The membrane was peeled off up to the abdominal wall and excised. The rather extensive capillary oozing present on the colon immediately after the removal of the membrane, soon ceased spontaneously, and no ligature was required except at the base of the membrane. The membrane was easily distinguished from the wall of the colon by its vessels, which ran longitudinally or diagonally along the colon, instead of across the colon as do the vessels

[1] Surgery, Gynecology and Obstetrics, September, 1900, p. 278.

[1] Read before the American Gynecological Society, May, 1911.

of the bowel wall. The appendix also was excised. The patient recovered without special incident and left the hospital feeling very well.

I explained to the patient that the restoration of the function of the affected portion of the bowel would necessarily be a gradual process, and it must be aided (1) by securing a regular bowel movement every day (to prevent decomposition and distension) and (2) by support of the abdominal contents to prevent overdistension of the cecum. For this latter I gave exercises, to strengthen the abdominal wall which was somewhat lax, and also an abdominal supporter to compress the lower abdomen. At this time (five months after operation) the patient is doing very well. She can eat and digest anything she wishes, but still has occasional attacks of pain in the right side. These pains are less frequent than before operation, but they are the same in character and location, and are evidently due to gas distension of the cecum. Whether they will disappear entirely or increase in severity remains to be seen. There seems to have been no diminution in the last month. This brings up the question as to whether removal of the membrane is sufficient to effect a cure in these cases. This point will be again referred to.

CASE 2. Miss R. G., aged 27, of slight build, rather thin, and markedly neurasthenic. For two or three years the patient has had attacks of pain in the lower abdomen. She cannot say definitely just when they began, but for the last year and a half they have increased rapidly and the last few months she has had the attacks every few days. Has had to give up her work and suffers almost constantly. Though the pains come in attacks, there is some soreness all the time. The pains are located principally in the right lower abdomen, but radiate throughout the abdomen and into the pelvis. There have been digestive disturbances off and on all the time, and constipation was marked for many years before the development of the attacks of pain. There has also been severe dysmenorrhœa. The patient is weak and nervous from the almost constant suffering.

The examination shows general hyperæsthesia of the abdomen and pelvis. The most decided tenderness is in the right lower abdomen over a large area involving the appendix and right adnexal regions. No distinct mass is made out in either the appendix or adnexal region. There was considerable gas distension.

Palliative internal treatment had practically no effect. Operation was then recommended for exploration of the pelvis and the right lower abdomen. When the abdomen was opened, the exploration of the pelvis showed a chronic salpingitis and oöphoritis in the right side, but this was not sufficient to account for the severe symptoms the patient had been having. Examination of the appendix showed it to be practically normal. The exploration was then continued up the cecum and revealed the condition shown in Fig. 2. The membrane

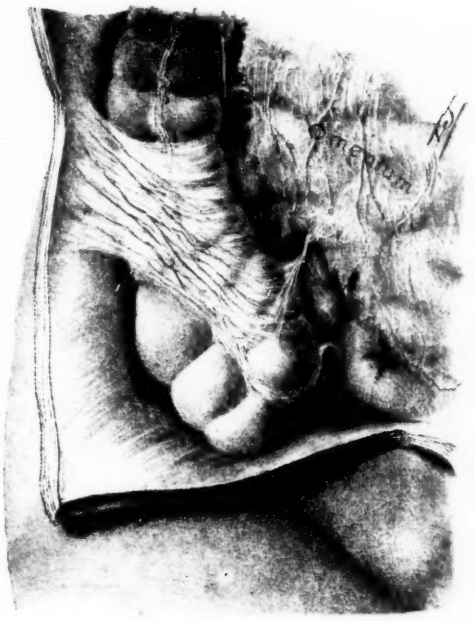

Fig. 1. Showing the distribution of the membrane in case 1. The membrane is represented but drawn aside. There is one adhesion of the omentum to the cecum. The vessels in the membrane are well shown, running longitudinally and obliquely along the colon instead of transversely as do the vessels of the bowel wall. The transparency of the membrane is indicated to some extent, but in the patient the wall of the colon was seen much more distinctly through the membrane—in fact, the membrane was so transparent that it would hardly have been noticed but for the oblique vessels lying in it. The appendix was practically normal.

extended across the ascending colon and was extensively adherent to the omentum—so much so that it was necessary to excise quite a large piece of the omentum. The constriction and interference with ascending colon was more marked than in either of the other cases. The cecum was markedly distended and was found extending across the median line under the incision. A median incision was employed in this case because of the associated pelvic symptoms, calling for a complete exploration of the pelvis.

The membrane was excised and the appendix removed. Also the right tube and ovary were removed because of the extent of the inflammation involving them. In addition the uterus was dilated and curretted because of the severe dysmenorrhœa. The patient recovered promptly and has been much improved, but it is too early yet for any estimate as to the ultimate result.

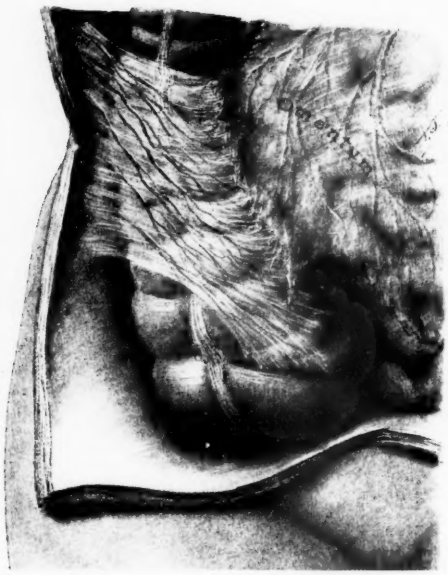

Fig. 2. Showing the membrane in case 2. Here the membrane was more extensive. There were strong adhesions of the omentum all along its edge. A part of the adherent omentum had to be excised. The vascular distribution and the transparency of the omentum were the same as in case 1. There seemed to be more constriction of the colon in this case and the cecum was greatly dilated. The appendix showed no lesion.

Fig. 3. Showing the membrane in case 3. The transparency of the membrane and the distribution of its vessels were the same as in cases 1 and 2. In this case the membrane extended down over the cecum and out on the appendix for a short distance. The appendix itself, however, was practically normal.

CASE 3. Mrs. C. W. B., aged 19, well nourished, rather stout, good general health, comes for relief from attacks of pain in the right lower abdomen which have troubled her for the past year. In two of the most severe attacks last summer she was confined to bed with pain and vomiting. The patient thought she had some fever, but there was no positive evidence. During the winter there were no long attacks, but shorter attacks every few days, and recently the pains have been present in the side nearly every day. The pains have become so persistent that she feels she must have relief. Inquiry developed the fact that for two years preceding these painful attacks in the lower abdomen, the patient was troubled with a great deal of indigestion. The indigestion has not been so troublesome since the development of the pains. There has been severe constipation for many years. Examination shows some tenderness in the appendix region, but it is not well localized. On bimanual examination some induration is made out in the right side. This induration is rather high and it is a question whether it is from the adnexa or appendix. The possibility of the trouble being membraneous pericolitis was considered, but I did not feel justified in making a diagnosis of such a rare affection when the more common affections would account for the symptoms.

At operation, the right rectus incision was employed so as to permit satisfactory exploration above and below the appendix region. The cecum was somewhat distended, but not markedly so. As soon as the cecum was drawn up into the wound a distinct membrane was seen. It covered practically all the anterior surface of the cecum, extending to the lower border and about the base of the appendix and even out on the appendix for a short distance. The membrane came from above and seemed to be of the same character as that noticed in the two cases previously mentioned. The appendix itself was practically normal. Extending the incision upward the ascending colon was exposed, with the condition shown in Fig. 3. The membrane in this case extended very low on the cecum, and the omentum was adherent as indicated in the illustration. The patient recovered without any particular incident and is doing well, but it is still too early to know what the ultimate result will be.

The distinctive symptoms of these cases develop from two factors: (1) interference with the peristalsis of the colon and (2) gas

distension of the cecum. The pains, though coming in attacks, somewhat like appendicitis or salpingitis, present the features of pain from distension rather than from inflammation. That is, there is no fever, there is not the acute disability caused by peritoneal inflammation, there is not the strictly limited point-tenderness that comes with an inflammatory focus. The pain and tenderness are more or less diffused throughout the right lower abdomen, there is decided gas distension with the attacks of pain, there is a history of the trouble beginning gradually and increasing persistently for one or more years, and there is a history of chronic constipation for many years before the onset of the distinct painful attacks. Of course, other conditions may be associated with the membraneous pericolitis, giving atypical cases in which may be found appendicitis, salpingitis, or other lesions of adjacent organs, with a consequent mingling of symptoms.

Speaking of the typical cases of membraneous pericolitis, I wish to call particular attention to three important points.

1. The frequent confusion with chronic appendicitis or adnexal disease, because the pain is located in the right lower abdomen and comes in attacks. This confusion in diagnosis is present in a large proportion of the cases.

2. The necessity of exploration of the ascending colon in all cases where the adnexal or appendical lesion exposed at operation does not account for the serious symptoms presented by the patient. In my first case I had no thought of this condition, but discovered the membrane in exploring around the cecum for some possible explanation of the persistent symptoms for which the condition of the appendix failed to account. In each of my other cases the possibility of this condition was considered before operation. In each case when it was found that the abnormality of the appendix or adnexa was not sufficient to account for the symptoms, the exploration was extended to the ascending colon, and the membrane found as previously explained. In one of Jackson's cases the patient, before coming under his care, had had two operations. In the first operation the appendix was removed, and in the second the ovary was removed without any relief, because the membrane causing the symptoms was not found.

3. The question of treatment. The treatment so far has been simple removal of the membrane, with subsequent regulation of the bowels and abdominal support to prevent distension of the cecum. Whether or not this will prove sufficient remains to be seen. The operations are of too recent date to speak definitely upon this point. It is entirely possible, however, that adhesions forming in the involved area may later cause recurrence of the obstruction, distension, and pains. It seems advisable to give the treatment by simple removal of the membrane a thorough trial. If it fails to effect a permanent cure, then more radical measures will be necessary, particularly in the severe cases.

What are the more radical measures that may be employed? Excision of the colon, recommended by Lane for chronic constipation from colon-constriction by "adhesions," seems hardly advisable until less severe measures have been given a fair trial. Anastomosis of the ileum with the sigmoid, so admirably presented by Noble[1] as a treatment for mucous colitis, seems to be preferable as the next step, if the simple removal of the membrane should prove to be insufficient for the purpose.

[1] Transactions of Am. Gynec. Soc., 1900, p. 110.

THE FUNCTION OF THE OVARY[1]

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I. DUALITY OF GLANDS OF INTERNAL SECRETION

THE study of the glands of internal secretion is complicated by their dual structure and dual function. In certain of these glands this composite make-up is more plainly recognizable than in others. The hypophysis for example has an anterior glandular lobe essential to the continuance of life, and a posterior "nervous" portion (1), which can be removed without causing death. The pancreas contains the islands of Langerhans, and those glandular structures which discharge through the duct of Wirsung. While in the thyroparathyroid complex the anatomical separation is well marked, in the adrenal, on the other hand, the cortex and the medulla fuse intimately, though evidence points to the fact that functionally these elements are distinct. The thymus is as yet too little known to permit of its classification in this schema. Both testis and ovary contain a portion whose secretion is external, and upon which devolves the perpetuation of race (semen, ova), and an internal secretory apparatus (Leydig or Sertolli cells in the testis, and follicles, corpus luteum, or interstitial gland in the ovary) which exerts important influences upon the entire organism.

The difficulties in analyzing the functions of any ductless gland are still further enhanced by the fact that these important structures, sufficiently complex when examined separately, apparently exercise a profound influence upon one another. At least in some instances, they appear able, interchangeably, to compensate each other's action, and removal of one gland may cause noticeable changes in the structure of another member of the group [ovary vs. hypophysis (2)]. No wonder, therefore, that their function has long remained a mystery to physiologists, and is as yet, in spite of intensive effort, only partly and imperfectly understood.

Scope of the paper. In order that this paper, which deals with the function of the ovary, remain within reasonable limits, it becomes necessary to exclude much of importance, and much of general interest. No attempt at completeness is aimed at, instead of this it is proposed to present chiefly anatomical observations and experimental results in such sequence, that they may form as nearly as the present state of our knowledge permits, an unbroken and logical chain. Observations derived from the human subject, with few exceptions, do not permit of the rigid criticism which can be exercised upon animal experiments, therefore, such observations will be excluded. Moreover, the mammalian ovary will alone be considered.

II. CONSTITUENTS OF THE OVARY

The ovary of all mammals is composed of ova, follicles, and stroma with vessels, lymphatics, etc. At certain times corpora lutea, one or more in number, and atretic follicles are found. In certain species the "interstitial gland" exists.

It is unnecessary, before a society of this character, to enter into a description of the formation and morphology of the Graafian follicle.

(a) The ovum. The ovum, apparently, has a highly specialized function — that of reproducing the species after fertilization by the male element. According to Loeb (3) the unfertilized ovum of the guinea pig can, while remaining within the follicle, undergo development to a limited degree (4). The changes taking place in the fertilized ovum do not interest us in this connection.

(b) The corpus luteum. Its origin. After rupture of the ripe follicle and extrusion of the ovum, the collapsed follicle undergoes a

[1] Read by invitation at the 36th Annual Meeting of the American Gynecological Society, Atlantic City, May 23, 1911. From the Pathological Laboratory, College of Physicians and Surgeons, Columbia University. Part of these experiments were conducted under a grant from the Crocker Special Research Fund.

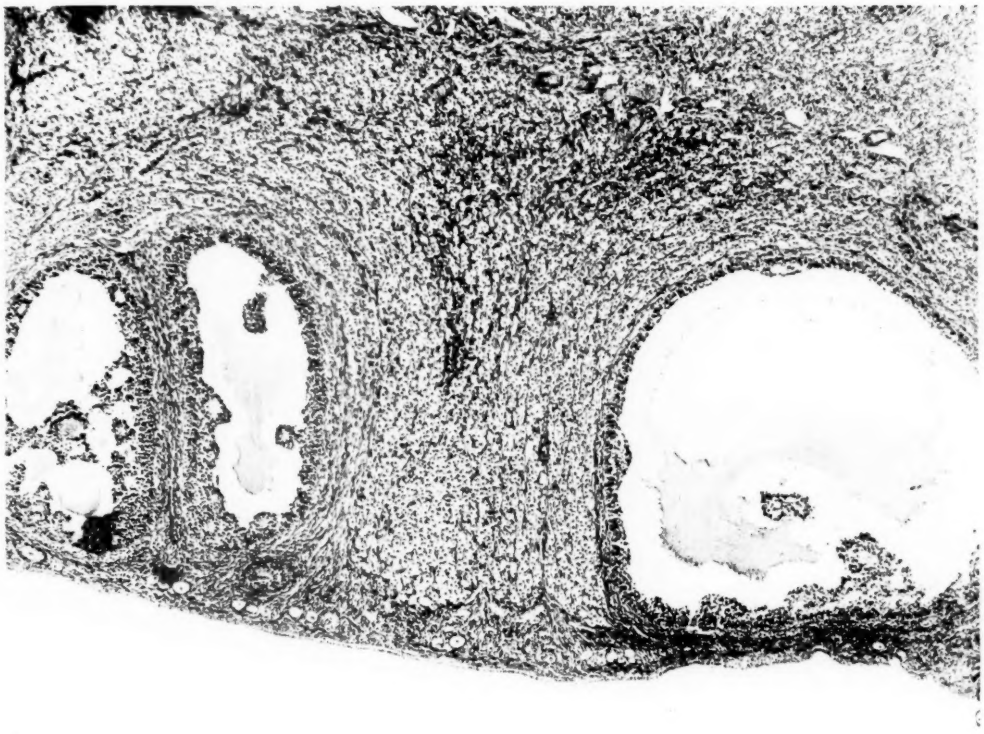

Fig. 1. Rabbit's ovary. Between the Graafian follicles closely crowded columns of large, clear, epithelioid cells are found separated by fine strands of connective tissue. These epithelioid cells form the "interstitial gland."

wonderful metamorphosis, which has given, and is still giving rise to discussion. Von Baehr (5) held that the structure, resulting after follicular rupture — the corpus luteum — was formed by the cells of the theca interna and was, therefore, connective tissue in origin. Bischoff (6) contended that the granulosa cells of the follicle furnished the lutein cells. Still other investigators credit the formation of the yellow body to the combined hypertrophy of granulosa and theca cells (granulosa lutein and theca lutein cells).

The weight of evidence appears to preponderate in favor of Bischoff's view, that the granulosa cells form the functionally active portion of the corpus luteum, and that, therefore, this gland is an epithelial structure. Sandes (7) who studied the development of the corpus luteum of dasyurus viverrinus, the native cat of New Zealand, a marsupial, found that in this species the theca interna is rudimentary in its development. In some instances he found that the granulosa cells had hypertrophied, undergone the change into lutein cells, and filled the entire follicle before the regular ingrowth of connective tissue and capillaries from the theca had occurred. His observations to me appear convincing.

In the bitch the granulosa cells may attain considerable hypertrophy before ovulation, and at part of the circumference may be raised into folds, growing into the cavity of the follicle (8). This preparatory growth and distribution, likewise, favors the view that the corpus luteum is epithelial in origin. (Fig. 2.)

Later in this paper it will be shown that

Fig. 2. Bitch's ovary. Unruptured maturing Graafian follicle. Above is seen the ovum, along the follicle wall is the layer of granulosa cells which below already show increase in number, hyperplasia of individual cells, and arrangement into wavy folds.

from a physiological standpoint the corpus luteum acts like an epithelial structure. Its derivation from connective tissue would outrage all of our present conceptions of gland physiology, for there is no example within the organism of any gland with either external or internal secretory function which develops solely from mesodermal structures.

(c) Atretic follicles. When follicular rupture does not occur, ripe follicles undergo regressive changes which lead to obliteration and finally to replacement by connective tissue. This process of follicle atresia has, likewise, proved a bone of contention (9). Essentially the process consists in gradual disintegration of the ovum and the granulosa cells with invasion of the thecal connective tissue (which assumes an epithelioid type) and its accompanying capillary network. The vascularization, however, falls far short of that observed in corpus luteum formation. Hæmorrhage into the cavity of the follicle, and other variations are of only subsidiary interest. Functionally the atretic follicle appears inactive.

(d) The interstitial gland. One other structure observed in the ovary of certain species (10) requires mention. This is the interstitial gland. When present it consists of greater or lesser aggregations of epithelioid cells, distributed diffusely, or in alveolar arrangement, in the stroma of the ovary. (Fig. 1.) At different times the interstitial gland shows great variations in the degree of its development. According to Lane-Claypon (11) the interstitial cells are derived from

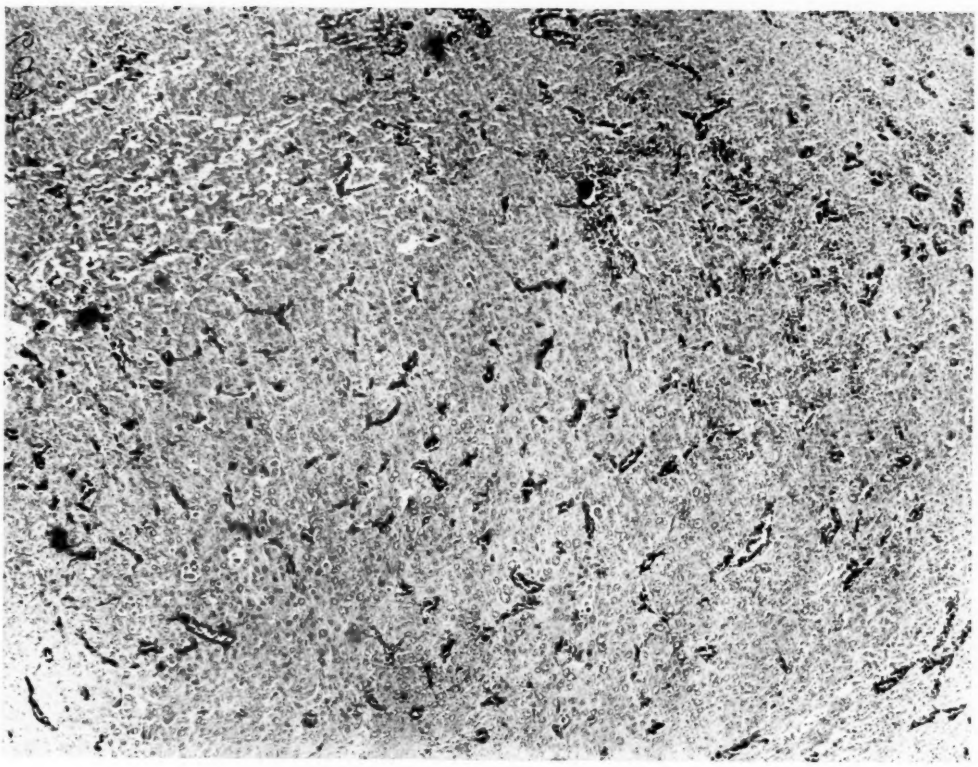

Fig. 3. Deciduoma from guinea pig's uterus.

primordial follicles; Limon and also Frænkel (10) derive them from the cells of atretic follicles, and Wallert (12) claims that in the human species, in which he believes that analogous structures occur during pregnancy, they originate from theca cells. It should be borne in mind that the interstitial gland is not only inconstant in its distribution among various species, but also developed to a variable degree at different seasons in the same species (13) and under *similar* functional conditions.

Having concluded these introductory morphological remarks on the changes which take place in the ovary, it is now in order to consider the relations of these various structures to the functional activity of the ovary and its dependent organs, first, however, enumerating the alterations noted in the uterus.

III. ŒSTROUS CYCLE. CHANGES IN UTERUS

Reproduction and the preliminary changes associated with gestation are dependent upon the activity of the ovaries. This statement requires no further elucidation at the present day. The phenomena arising during the exercise of this important function must, however, be considered in more detail. Failure to analyze the stages of the process have given rise to misunderstanding and misconception, when efforts were made to correlate observations from animals and to apply them to the human species.

(a) Nomenclature. The nomenclature proposed by Heape (14) and employed by Marshall in his admirable volume on "The Physiology of Reproduction" (15) is recommended for general adoption. It will be adhered to throughout in the present paper.

Fig. 4. Deciduoma from white rat's uterus.

Heape restricts the term "rut" to such males as at certain seasons exhibit a special development of their sexual organs and sexual powers, often accompanied by coincident changes in the so-called secondary sexual characteristics (16). The "breeding season" applies to both sexes, and includes the entire period during which a mammal is concerned in the production of the young (including therefore, pregnancy and lactation). The "sexual season" embraces that period during which the sexual organs are periodically active. It may be interfered with by pregnancy which disturbs the rhythm. The quiescent period in the female is called "anœstrum." The "proœstrum" is characterized by increased vascularization of the genital organs ("coming on in heat"), and the climax is attained in the "œstrus" (heat) during which only, in most mammals, the female experiences desire and permits the approach of the male. If conception and gestation do not occur, a more or less prolonged period of rest, "metœstrum," is inaugurated, which in some species merges into the anœstrum. In other species the metœstrum is succeeded by only a short period of quiescence, the "diœstrum" and then the cycle recurs throughout the extent of the sexual season, unless interfered with by gestation. Animals which show but one œstrous cycle during a sexual season are called "monœstrous," by Heape; those in which there is a recurrence of the cycle are termed "polyœstrous."

It is especially important to distinguish sharply between proœstrum and œstrus, and to realize that in the primates and human species menstruation corresponds to proœs-

trum. This point will later be dealt with in greater detail.

(b) Uterine changes during the cycle. In the ovary we found certain structures — some always present, others transitory — which have to be considered in an analysis of the functions of this organ. The same applies to the uterus though conditions are here more simple. The uterine musculature undergoes hypertrophy or atrophy, but on the whole plays but a passive rôle. Of greatest interest is the mucosa. The surface epithelium, gland epithelium and stroma, show well marked, and often independent changes, which may be studied together or separately. Purely morphological researches proved inconclusive and confusing until correlated with functional states. Our knowledge has undergone a distinct process of crystallization during the past few years, which will permit of somewhat shorter treatment of this phase of the subject than would have been possible some time ago.

Anœstrum. In all mammals known to us, the uterus during its anœstrous (resting) stage is a flaccid anæmic organ, covered internally by a thin, pale layer of mucosa. This membrane is limited by a single layer of epithelium, which is pierced here and there by the openings of glands. In this stage the glands likewise exhibit a single, regular layer of epithelium. The stroma is exquisitely connective tissue in type, composed of spindle cells and round cells with small cell body. Extreme variations in size, distribution, and number of these elements are noted in different species, but in essentials the above description applies.

Proœstrum. When under appropriate conditions of season, nutrition, etc., the animals "come on in heat," and the proœstrous period is entered upon, the uterus increases in size, all its constituents taking part in this hypertrophy, an increased vascularity adding still further to the enlargement noted. The mucous membrane in particular becomes thick, velvety, and succulent. Examined at this stage it is found congested, at first covered with mucus, which, later, in some animals, becomes streaked with blood or even largely hæmorrhagic (bitch, cow).

Detailed examination of the mucous membrane shows that the epithelium evinces signs of functional activity. The cell body increases in size, and contains secretory products. The connective tissue is succulent, its meshes appear to contain fluid, the capillary network is filled to the bursting point.

The number of glands noted in the stroma has increased and their course is increasingly tortuous. Among certain species the end of the proœstrous period can be recognized by the appearance of blood. The bitch usually does not accept the male until blood shows itself (17). The higher apes, in whom periodic menstruation occurs, copulate throughout the sex season, and therefore, do not afford more data than those observed in human beings (18).

Œstrus. During the œstrous period further changes manifest themselves in the non-impregnated uterus. They have been studied most carefully in the bitch (17 and 19), rabbit (20 and 21), and guinea pig. Observations made by Heape upon monkeys (18) are also of importance.

Summarized, these changes consist of multiplication of the epithelium by amitotic (rabbit) or mitotic division [guinea pig (22)] and increased proliferation of the interglandular connective tissue and number of folds in the mucosa (21, 19, 6).

If, as in the present instance, impregnation has not occurred, the uterus returns to its resting condition (monœstrous species) or after a short and incomplete involution a new cycle is inaugurated (polyœstrous species).

At this time and place it is unnecessary to describe in greater detail individual variations, or to adhere to the arbitrary classifications employed by various investigators for the recognition of the stages undergone during the cyclical changes (Heape and others).

IV. CORRELATION OF PHENOMENA OBSERVED IN OVARY AND UTERUS

This concludes the description of the changes noted in both uterus and ovary. It now becomes necessary to correlate these various phenomena and to study their physiological significance.

Two methods of investigation have long

enjoyed great popularity in this connection—that of castration and that of transplantation of the ovaries. By these means it has been proved that the power of reproduction and the continuance of the sexual cycle is dependent upon the ovaries, but as these operations involve either the entire ablation or entire restoration of the sex gland, the function of the individual components of the ovary were lost sight of (23). It is not considered necessary to attempt to refute the hypothesis which deals with the internal secretion of the uterus, and ascribe to this organ a power of control over the ovaries, Bond (24), Blair-Bell. It has remained for newer and more subtile experimental methods to determine at least some of these desired facts. X-raying the ovary, ectropionization Villemin (25) that is, transplantation between the layers of the abdominal wall with the vascular pedicle intact, have given no concordant results.

The knowledge that œstrus and ovulation do not always coincide has proved a stumbling block to many theories. Observations made upon the human species are almost negligible partly because insufficient attention has been given to the exact age (particularly the early stages) of the corpus luteum (26)—the presence of which is an infallible indication that ovulation has at some time taken place—but chiefly because no regularly occurring period of desire, which might be used as a fixed point in the cycle, manifests itself in the primate and human species. We are, therefore, compelled to obtain the facts from investigations conducted on lower animals.

(a) Proœstrum and maturation of follicles. In all the forms so far investigated except perhaps in monkeys [Heape (18)] the proœstrous manifestations occur coincidentally with the maturation of ovarian follicles. The acceptance of the male is a reliable sign that this stage has been reached or is approaching its end. In most animals ovulation then at once takes place, either spontaneously or as the result (?) of coitus—particularly in the rabbit—(27). The bat forms an apparent exception to this rule. Insemination (which corresponds with œstrus) is performed in the autumn, but ovulation does not occur until the spring time, the spermatozoa remaining inactive within the female generative tract for many months (March or April). Throughout the time of hibernation, however, the follicles destined to rupture and to form corpora lutea, are prominent and slowly increase in size, although the remainder of the ovary remains in a stage "of relative repose" (28). We are, therefore, justified in considering ovulation uninterruptedly following upon œstrus even in the bat. Although the interval between coitus and follicle rupture, which in most forms occupies but a few hours, is greatly prolonged in this variety by hibernation and the undue slowness of complete follicle maturation. With these apparent exceptions, the rule that proœstrum and maturation of the follicle coincide, and that œstrus is ordinarily succeeded by ovulation, appears to hold true.

Under the rigid criteria that I deem it necessary to insist upon before accepting a fact as proved, it has not been demonstrated that maturation of the follicle produces proœstrum and œstrus. We do know that they coincide, and that no other structure in the ovary shows a similar fixed relation to these phenomena.

(b) Œstrus and ovulation. Œstrus, as has been shown, is dependent upon and immediately succeeds the proœstrum. In some species the two stages are more distinctly separable than in others. Ovulation, on the other hand, need not bear a similar close and definite time relation to œstrus in all species, although probably it is alike in individuals of the same species. In the bitch for example (17) ovulation may occur before œstrus is over, in the rabbit (13 and 29) rupture of the follicle takes place nine to ten hours after coitus, in the bat (28) months elapse between œstrus and ovulation. In the rabbit ovulation is supposed to depend upon coition. On the other hand, it is well established that the guinea pig (30), bitch (8 and 17), rat (31), and sow (8), for instance, can ovulate spontaneously. It is, therefore, necessary not only to study the phenomena that succeed and are dependent upon ovulation and corpus luteum formation, but also to analyze the forces which hinder or accelerate follicular rupture.

(c) Ovulation. In considering the phenomena that accompany and follow ovulation a

sharp distinction furthermore must be drawn between the changes that take place when the female and the male are together, and what occurs when the female is segregated from the male. This precaution has been largely neglected until recently. For the moment we will postpone discussion of those changes which take place in the presence of the male, and limit our remarks to the female kept in isolation.

1. Function of the corpus luteum in the absence of pregnancy. If ovulation has taken place one or more corpora lutea develop. The study of the function of the corpus luteum is the most important phase of the entire subject.

(a) Theories. A number of theories, which aimed to explain the phenomena of the sexual phases, particularly the cyclical appearance of the œstrus or menstruation are on record. Pflüeger (32) and Strassmann (33) believed that increased intraovarian tension caused rupture of the follicle. Innumerable experiments have proved that the nervous system plays no definite rôle [Goltz (34), Knauer (35), Cramer (36), Halban (37), Marshall and Jolly (38)]. Beard (39) ascribed to the corpus luteum the power of suppressing ovulation, Sandes (7) agreed with this assumption. Frænkel (40) performed experiments which convinced him that the corpus luteum induces the periodic vascularization of the uterus, and subserved important functions by favoring the nidation of the ovum. As we are at present dealing solely with females segregated from the male, this latter phase will be dealt with further on.

(b) Maternal decidual reaction (Loeb). It remained for the researches of Leo Loeb (41) to arrive at a definite and detailed analysis of the various influences exerted by the yellow body upon the uterus. Until recently his experiments were largely carried on with animals in whom the period of ovulation was determined by the acceptance of coitus, the occurrence of pregnancy, however, being prevented (when it was deemed expedient) by ligation of the tubes before the ovum had reached the uterus.

In rabbits and guinea pigs mechanical irritation of the uterine mucosa from two to nine days after coitus (splitting open the entire lumen, etc.) was followed by the appearance of transitory nodules composed of the uterine stroma, and resembling in every way the decidual tissue usually found at the placental site (maternal placenta) of the variety of animal used. (Fig. 3). These tumors persist for about 10 days and then undergo necrosis. When the ovary is removed before incising or when all the corpora lutea are destroyed (cautery or excision) deciduomata do not form. If portions of the uterus are transplanted to other sites in the same animal (homologous transplantation), deciduomata, but to a lesser degree, may develop. This decidual reaction is dependent upon the presence of the corpus luteum, and either because the uterus is receptive during a definite limited period only, or because the internal secretion of the yellow body loses this specific function with maturation (42), the reaction can not be obtained throughout the entire existence of a given crop of corpora lutea. Later on I will refer to the fact that I have obtained deciduomata also in rats, besides in rabbits and guinea pigs.

Efforts to prolong the existence of deciduomata by transplantation into other animals, who were at the beginning of their critical stage, have not been successful.

Growth of deciduomata in vitro. In a series of experiments performed by Dr. R. A. Lambert and myself, we were unable to grow deciduomata of guinea pigs or rats in vitro by the method of Harrison as modified by Carrell and Burrows.

From eight rats and five guinea pigs numerous tissue cultures were made, using the blood plasma of the animal and attempting to cultivate deciduomata alone, or in close proximity to fragments of corpora lutea. The connective tissue growth that was obtained differed in no way from that seen when normal uterine or ovarian tissues or animal sarcoma was employed. In a few instances epithelial growth was noted. This also showed no special characteristics. The deciduoma tissue showed less vitality and less proliferative activity than normal tissues.

No definite conclusions can be drawn from these findings. To a certain extent they confirm the view that the stimulus needed to pro-

duce deciduomata is extremely specific, and also, that, as Loeb states, at any given period only minute quantities of the activating substance exist in the blood stream — apparently not sufficient to activate the cultures in the single drop of fluid in which they are grown.

2. *Influence of the corpus luteum during pregnancy.* It now becomes expedient to broaden the scope of the discussion to include the changes observed after fruitful coitus, i. e., during pregnancy.

Frænkel (40 and 43) by means of a large series of experiments performed on rabbits came to the conclusion that the corpus luteum not only produces the circulatory changes in the uterus during proœstrus and menstruation, but also was essential to nidation and to the continuation of pregnancy by vascularizing and softening the mucosa. For whenever the corpora lutea or the entire ovary had been removed during the first half of pregnancy, abortion or absorption of the fœtuses took place. Some investigators who have repeated Frænkel's experiments agreed with his findings, others reported that pregnancy continued undisturbed.

It remained for Loeb to show why the corpus luteum is essential for nidation.

(a) Nidation. Without the presence of the corpus luteum the fertilized ovum, which acts like a foreign body in the uterus, is unable to call forth the production of maternal decidua, and is, therefore, unsuccessful in obtaining a foothold in the unprepared (unsensitized) uterus. Frænkel's experiments depended upon the continuation of pregnancy for an index. In the rabbit many indifferent factors serve to interrupt gestation, as was shown by Loeb and Hunter (44). Therefore both Frænkel's supporters and opponents alike, by using his method, obtained discordant results, because of the inherent weakness of this method of research.

The actual state of affairs, and neither Frænkel's, Dael's (45), Mandel's (46) or Marshall and Jolly's (47) results are discordant with this explanation, is as follows: Nidation of the ovum is assured by the reaction of the uterus, called forth by the presence of a foreign body (ovum), and resulting maternal decidua formation. The corpus luteum enables the uterus to produce this reaction. Although decidua formation is essential to nidation, the ovum when once attached, soon becomes independent, and removal of the ovaries or corpora lutea then no longer results in abortion or absorption of the products of conception. Loeb has also shown that the quantitative amount of decidual reaction, which can be called forth by experimental methods is far in excess of the actual requirements of the ovum. It is nature's custom to be prodigal and to allow for a large factor of safety. The function of the decidua is not clearly understood. By some it is regarded as a barrier, interposed by the mother against further invasion of the trophoblast (48), by others [Ritter (49), Lockhead and Cramer (50)], its function is regarded as nutritional.

(b) Extrauterine pregnancy. As in the rabbit and guinea pig neither the Fallopian tube, ovary, or peritoneum respond to the effect of corpus luteum secretion, ectopic gestation does not occur in these animals according to Loeb (44). Webster (48) considers tissue derived from the Müllerian duct necessary for nidation, but no proof of this theory has been forthcoming.

Marshall (p. 142) mentions a case of abdominal pregnancy occurring in a cat (Gofton) and also refers to a case of primary abdominal pregnancy in a rabbit (Blair Bell, Surgery, Gynecology and Obstetrics, May, 1911, p. 471). Perhaps our present experimental methods are insufficient to call forth the decidual reaction, except in the uterus. A specimen I obtained from a rabbit consists of seven lithopedia, found free in the abdominal cavity. In this case, however, an old healed scar in the uterine wall led me to regard the pregnancy as secondarily abdominal, probably the result of trauma. W. L. Williams (51) also mentions tubal pregnancy in the sow.

3. *Factors which favor or inhibit ovulation.* It is now necessary to turn from the discussion of the phenomena occurring during pregnancy, in order to study the factors which favor or hinder ovulation, because it will be found that pregnancy has been considered one of the most potent of the latter influences.

(a) Influence of coitus on ovulation. Several investigators have claimed that in certain species ovulation fails to take place unless coitus is allowed. The rabbit has been thoroughly studied in regard to this observation.

Regand et Dubreuil (27) from a careful series of experiments concluded that rabbits did not ovulate without coitus. Heape (29) says the same.

(b) The supposed influence of the interstitial gland. Bouin and Ancel (52) generalizing from these and other observations have divided animals into two large classes, those with spontaneous ovulation, which have a cyclical corpus luteum, and those in whom ovulation takes place solely after coitus, which possess the corpus luteum of gestation only. They claim that the second class alone possess an interstitial gland in the ovary and that this gland subserves the function of replacing the action of the cyclical corpus luteum. Frænkel (10) has subjected the ovaries of some eighty species of animals to careful investigation, and finds the interstitial gland present in about fifty per cent. In his last paper he accepts the explanation offered by Bouin and Ancel (53).

Among those animals which have an interstitial gland both authors include the rabbit and guinea pig; Frænkel also mentions the rat and cat. If, then, their ideas are tenable spontaneous ovulation should not occur in these species.

Spontaneous ovulation. Observations on the rabbit. In my own experience I found that but two rabbits, in a series of twenty-seven, whose ovaries were studied in serial sections, contained corpora lutea. These animals were virgin and had been kept isolated for months. Of rabbits postpartum, only two were studied, the ovaries of one containing large cystic follicles, but no corpora lutea, the second having recent corpora lutea in both ovaries but from their microscopical appearance it was evident that ovulation had taken place as late as nine or ten days after birth of the young.

Spontaneous ovulation postpartum. I have gathered further data dealing with spontaneous ovulation using the termination of labor as the fixed period in the cycle and in addition to the microscopical appearance of the corpus luteum at times also used its functional activity as an indicator.

In ten guinea pigs and ten rats the uterus was incised, after the method of Loeb, two to nine days postpartum without permitting coitus. In nine of the guinea pigs and in seven of the rats deciduomata were found in the uterus. (Figs. 3 and 4.) Fresh corpora lutea occurred in all animals. The same method of experimentation was employed in three cats, one five, and two seven days postpartum with negative result in two, and with recent corpora lutea seven days after labor in one. No deciduomata were found. In nineteen observations on guinea pigs twelve hours to nine days postpartum recent corpora lutea were found in each instance except in the animal twelve hours after labor. In twenty-one similar observations on rats two to seven days postpartum, recent corpora lutea were found without exception.

These experiments show that spontaneous ovulation takes place postpartum (24 to 48 hours after labor) in the guinea pig and white rat.

In a large number of virgin white rats kept isolated for long periods of time, corpora lutea were found in the ovaries in almost every instance. No effort, however, was made to determine how frequently ovulation occurs in this species.

Even in the case of the rabbit, therefore, the hypothesis of these authors (Bouin and Ancel) does not apply. As corroborative evidence the experiments of Iwanoff (54) may be quoted. He succeeded in fertilizing two rabbits by artificial insemination two days postpartum. I have just shown that guinea pigs and white rats and cats whose ovaries also contain the interstitial gland, may ovulate spontaneously.

Loeb (30), however, accords some influence to copulation. He considers the three main factors requisite for ovulation to consist in: The time necessary to allow of ripening of the follicles, (2) removal of the inhibitory action of the corpus luteum, (3) more or less accidental conditions, such as coitus.

Let us now discuss those factors that inhibit ovulation.

(c) The corpus luteum inhibits ovulation. Loeb's experiments. Loeb's most recent work substantiates Beard's hypothesis in reference to the inhibitory action of the corpus luteum on the appearance of œstrus. He arrived at his conclusion by the following experiments (30).

In sixty-six guinea pigs the exact time of ovulation was determined by their accepting coitus, but pregnancy was prevented by ligation of the tubes. Of these animals twelve within sixteen to thirty-four days ovulated spontaneously without renewed coition (as shown by the finding of fresh corpora lutea), four, or six per cent ovulating within sixteen to eighteen days, and four within nineteen days of the coitus. From this it becomes evident that spontaneous ovulation in the guinea pig occurring within sixteen to eighteen days after a preceding ovulation is uncommon.

In forty-five animals in which it was attempted to remove all the corpora lutea, the effort was crowned with success in twenty-five cases. With the exception of three guinea pigs, the others (twenty-two in number or ninety-two per cent) all ovulated within twelve to sixteen and one-half days after coitus, thus showing a considerable shortening of the interval between ovulations.

By first permitting coitus, Loeb, in these experiments, obtained a fixed date from which to calculate the interval occurring between two periods of ovulation, the second uninfluenced by the presence of the male. The date of the second ovulation was determined by examining the new corpora lutea, careful histological studies enabling him to recognize the age of the yellow body with certitude.

Persistent corpus luteum in the cow. Corroborative evidence that the corpus luteum inhibits ovulation and heat, is furnished by a fact well known to veterinarians (51). The cow normally shows signs of œstrus every three to four weeks. Some cows suffer from so-called "dumb œstrus," during which they do not go into heat for long periods of time. The ovaries of such animals contain persistent corpora lutea. When the corpora lutea are expressed (pressure upon the ovaries is exerted by grasping them, by means of the hand inserted in the rectum) the return of heat is noted within a few days.

(d) Pregnancy does not inhibit ovulation. The two foregoing series of observations substantiate the view that the corpus luteum inhibits ovulation. The question naturally arises whether, in pregnancy, in which ovulation does not usually occur, it is again the corpus luteum, or the pregnancy, or both factors acting together which inhibit rupture of the follicle.

Loeb (30) has shown that pregnancy, per se, will not inhibit ovulation, for if he removed all corpora lutea during pregnancy (at an early period, but sufficiently long after nidation to permit the continuation of pregnancy), ovulation occurred, and new corpora lutea appeared.

It is, however, known that œstrus does occasionally take place in the mare, cow and sow during pregnancy (Marshall, Williams). Heape (14) also mentions the occurrence of "false heat."

In a series of nearly fifty newly purchased rabbits which were to be impregnated, I observed three in which pregnancy was not detected and which readily accepted the male. Of these, two aborted the next day and died, the third aborted but survived. All three were at about the middle of pregnancy (as could be determined from the size of the fœtuses), the period of gestation in the rabbit being about thirty to thirty-two days. Whether ovulation took place under these conditions was unfortunately not ascertained.

4. What factor causes persistence of the corpus luteum? From the foregoing it becomes apparent that the products of conception do not prevent ovulation, but that the corpus luteum does. Nevertheless œstrus may sometimes take place during pregnancy. The condition of the ovaries under these abnormal conditions has not been studied and we are as yet unable to state whether the usual destructive influence of the corpus luteum on maturing follicles has failed to occur, or whether abnormal œstrus has taken place without the influence of follicle maturation.

It would naturally suggest itself that the pregnancy — that is, either the fœtus or the

trophoblast or the two combined—causes the persistence of the corpus luteum regularly observed during gestation. The two following observations make this doubtful.

(a) That pregnancy is not the sole stimulus which may occasion the persistence of the corpus luteum seems likely from the observation, previously referred to, that persistent corpora lutea are observed in the non-pregnant cow.

(b) A series of as yet not definitely conclusive experiments which may prove to have some bearing on the question are at present being performed by me in conjunction with Mr. A. Unger.

An emulsion of rat fœtuses [some in five per cent ether water according to the technique recommended by Askanazy (55)] were implanted in the abdominal cavity or abdominal muscles of white rats. In a few instances so-called "experimental teratomata" of some size developed. No effect on ovulation or persistence of the corpora lutea has been observed (48 days is the longest period of observation up to date; gestation of the rat extending over 21 days).

Daily injection of extract of rabbit's fœtuses into rabbits (four animals) for a period of nine to twenty-six days, also seemed to exert no influence on the maturation of follicles or upon the persistence of the corpus luteum (present in one animal). The same applies to similar experiments, performed by us on rats with rat fœtus extract (four animals injected for nine to twenty-eight days).

As the injection method appears to have many disadvantages we ascribe little or no value to the results, or lack of them. However, where fœtal tissue continues to grow in the body, as in the experimental teratomata, results whether positive or negative should be accorded some consideration. The work upon experimental teratomata will, therefore, be continued.

Sandes mentions an interesting fact. In dasyurus intrauterine pregnancy occupies but eight days. The young are then expelled and raised for seven to eight weeks in the pouch. The corpus luteum, however, persists throughout the period of lactation. He does not mention the duration of the corpus luteum, when impregnation fails to occur.

V. INFLUENCE OF THE OVARY AND CORPUS LUTEUM ON THE MAMMARY GLAND

Although the scope of this paper will not permit me to dwell upon the effect that the ovaries exert upon other glands in the organism, this omission does not apply to the breast, because this is to all intents and purposes a genital gland, and because the effects of the products of conception are here also credited with important influences.

The work of Foges (56) has shown that castration in early life causes the breasts to remain at an infantile stage of development. Ribbert (57) demonstrated that the transplanted breast of the guinea pig hypertrophied and secreted milk in a subsequent pregnancy, thus eliminating nervous influences. The stimulus which brings about the increased mammary development of puberty is generally conceded to originate in the ovary. The cause of breast hypertrophy during pregnancy, however, is still unclear. Halban (58) has ascribed this rôle to the placenta, Basch (59) tried to demonstrate an ovarian placentar interaction, and Lane-Claypon and Starling (60) consider a hormone elaborated by the fœtus the activator.

In conjunction with Mr. Unger, I repeated Claypon and Starling's experiments, first using white rats, injecting them with the extract obtained from sow fœtuses (61). The results were negative. We then injected rats with rat fœtuses, again obtaining negative results. Upon using rabbits (which were the animals employed by Claypon and Starling) the results were so discordant that we were led to investigate the physiology of the rabbit's breast more closely. We then found that with the first rut the breasts enlarged, showing increased branching of the large ducts with dense budding of the finer ducts and alveoli. In the few rabbits in which corpora lutea developed (two) the growth was even more marked. After rut partial regression occurred, comparable with the autumn loss of foliage in a tree, the bare branches being left. Starling's results, which agree with our findings in normal animals, must, therefore, be ascribed to the cyclical breast changes which take place. This applies as well to the work of Foà (62), and Biedl and Koenigstein (63).

Bouin and Ancel (64) recently described the cyclical mammary change in the normal rabbit's breast after "sterile" coitus, their results and our own agreeing in most essentials.

For the present, therefore, we are justified in presuming that the influence of the ovaries produces the development of the breast in pregnancy, just as it does during rut. Apparently different species and even different individuals of the same species show variations in the intensity of œstrous breast changes. Some virgin bitches are able to suckle after rut. White rats, we have found, apparently show no variation during the cycle. The question will probably remain obscure until we discover the factor which causes the persistence of the corpus luteum during pregnancy. At present it seems most probable that the maturing follicle causes the cyclical change and that the persistent corpus luteum accounts for the hyperplasia found in pregnancy.

Experiments dealing with the growth of "experimental teratomata" in white rats were previously mentioned. We are watching two series, one in non-castrated, the other in castrated animals, with the hope of gaining additional data on the effect upon the breasts of fœtal tissues growing in the maternal organism.

VI. CHEMISTRY OF THE CORPUS LUTEUM

Before concluding the discussion of the function of the corpus luteum it may prove of interest to refer to the few discordant and unconnected facts which bear upon the chemistry of this gland.

It has been known for many years that the corpus luteum contains fatty substances which have been called lipochromes [see Aschoff (65)]. No very exact study of their composition has been made. Wallert (66) studied the luteum contents of the corpus luteum in the pregnant cow's ovary at different periods of gestation. He discovered no great differences. Nevertheless, he concludes that the corpus luteum supplies the ovum with yolk substance which in mammals is deficient. This view appears fanciful.

Dr. J. Rosenbloom, of the Department of Biological Chemistry of the College of Physicians and Surgeons, permits me to mention some as yet unpublished data he obtained in the same way as Wallert, but in which the chemical examination is free from the inaccuracies of which that author was guilty. The ovaries (without the corpora lutea) and the corpora lutea of three series of cows were examined: (a) non-pregnant, (b) pregnant with fœtuses of four to twenty inches in length, (c) pregnant with fœtuses of twenty to sixty inches in length. These series showed no appreciable or regular increase in either neutral fats, fatty acids, lecithins, or cholesterols.

The microchemical researches of Cicaccio (67), Miller (68), etc., add nothing of value, because the methods are imperfect and unreliable. A perhaps more promising field is just beginning to be explored. The quantity of activating substance that reaches the uterus, breast, etc., is evidently small, and may be in the nature of a ferment.

Ferments in the corpus luteum and uterus. Koblanck and Loeb (69) found that the cow's ovary contains a peptid splitting ferment. Bouin and Ancel (70) consider the active substance of the ovary to be a lipoid. Their sole criteria of the functional activity of these lipoids consisted in noting a toxic effect when intravenously injected into rabbits. As I have pointed out elsewhere (71) such criteria are insufficient. Unless definite physiological changes — comparable to those occurring in proœstrum or œstrus — are obtained no valid conclusion can be drawn. Halban and Frankl (72) injected tryptic ferment into the rabbit's uterus and claim to have obtained changes resembling those in proœstrum. They also found a tryptic ferment in the mucosa of the human uterus during the premenstrual phase and in the interval.

Marshall and Jolly (77) injected the blood serum of an œstrous bitch into an anœstrous animal of the same species and claim to have obtained mild and transitory symptoms of heat. They also obtained similar results by transplanting ovaries of œstrous bitches into anœstrous animals (four experiments). The nature of the active substance was not investigated.

Mr. T. Lefkowitz (working in the Department of Physiological Chemistry) and myself are at present investigating the ferment contents of the ovary and uterine mucosa (sheep and cow) at different functional stages. For sake of comparison we are using the mucosa

of the bladder (an inert organ) obtained from the same animal. All the more important ferments are being tested for quantitatively. The results so far obtained, which may require revision, are:

1. Trypsin (alkali protease) and pepsin (acid protease) were both found in the ovary and uterine mucosa of non-pregnant and pregnant animals. Quantitatively there was no increase during pregnancy.

2. Lipase was more abundant in the uterine mucosa of non-pregnant animals. In the ovaries the values were the same.

3. Erepsin was present in very small quantity in the ovaries; the uterine mucosa containing a considerable amount, part of which must have been contributed by the blood. Nevertheless there was no increase during pregnancy although the uterus in this phase contains more blood.

4. Amylase was more abundant in both ovary and uterine mucosa of pregnant animals than in the non-pregnant.

Of these results the only one that, at the present stage of the investigation, appears to have any significance is the increase of amylase noted during pregnancy. As Lockhead and Cramer (50) have shown the mucosa of the pregnant rabbit contains much glycogen at those spots at which the placenta is attached, and from this source the fœtus obtains most of its carbohydrate nutriment. The results do not increase our knowledge of the source or nature of the active substance or substances secreted by the ovary.

This concludes the review of what we know of the function of the ovary which, as readily appears from the foregoing, governs all the important physiological activities of the sexual organs. For the sake of clearness I will recapitulate briefly the main facts which have been referred to.

CONCLUSIONS

1. Both from anatomical evidence and functional behavior the active portion of the corpus luteum must be regarded as an epithelial structure.

2. A sharp distinction should be drawn between proœstrum and œstrus — menstruation is the homologue of proœstrum.

3. Proœstrum and maturation of follicles coincide in all mammals,— but as yet no proof has been forthcoming that maturation actually causes proœstrum.

4. The period of desire (œstrus) is the climax of the preparatory changes occurring during proœstrum and probably due to the same causation.

5. Ovulation is the end result of follicular maturation. In some species it occurs during or immediately after œstrus, in others the bursting of the follicle is postponed for months. Such differences in time relation are most probably accounted for by the rate of growth of the ovum and follicle.

(a) Ovulation may be accelerated by coitus.

(b) Ovulation is inhibited by the corpus luteum.

6. (a) The corpus luteum sensitizes the uterine mucosa and thus renders it responsive to mechanical stimuli (with resulting formation of maternal placenta).

(b) The corpus luteum is essential in the early part of pregnancy, as the ovum fails to obtain a foothold unless the uterus is sensitized.

(c) The corpus luteum lengthens the sex cycle by interfering with the maturation of growing follicles and ova.

(d) The factor which causes the persistence of the corpus luteum during pregnancy has not been discovered. Persistence of the corpus luteum may also be found independent of gravidity.

7. Animals with interstitial glands in their ovaries may ovulate spontaneously, consequently the interstitial gland has not been shown to replace the function of the cyclical corpus luteum.

8. Growth of the mammary gland is due to ovarian influences (maturation of follicles, activity of corpus luteum). The same factors which produce the persistence of the corpus luteum, probably cause the breast hyperplasia of pregnancy.

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1. *Castration.* There are a few other points to which I desire to refer briefly, although, strictly speaking, they are not dependent upon the functional activity of the

ovary, but rather upon the absence of this physiological action. The effect of castration in infancy causes the sex organs to remain at an infantile stage. Some of the secondary sexual characters remain undeveloped or become neutral. Changes in growth are striking. Some of the other glands of internal secretion are affected (hypophysis). Castration in adult life is followed by appearance of the menopause and atrophy of the organs of sex. Therefore, it seemed logical that Loewy (73), Neumann and Vas (74), and many others should have noted profound changes in the metabolism after castration performed on normal animals, osteomalacic human beings, etc. Yet the most recent and apparently most careful research, that of McCrudden (75), led him to conclude that no change in the metabolism of energy occurs after castration. In view of these discrepancies, more work dealing with both the metabolism of energy and gaseous exchange is urgently needed to decide this important question. Neumann and Herrmann (76) in a recent study claim to have found that after castration or X-raying the ovary the blood contains a greatly increased amount of cholesterin or cholesterin compounds. The same obtains late in pregnancy; hence they conclude that during gravidity the ovaries do not functionate.

2. *Ovotherapy.* The views on the effectiveness of ovotherapy are in an equally chaotic condition. I have expressed my own convictions, based upon an experimental study in which fresh corpus luteum extract was employed (71). All physiological tests that could be devised were used, with uniformly negative results upon the genital sphere.

These experiments were performed on rabbits and guinea pigs using the corpora lutea of sows. Since then, I have had occasion to inject three rabbits with rabbit ovaries for eleven, sixteen, and twenty-nine days, respectively, with negative results.

If then, ovotherapy is in the future found to be in any way effective, and I am unprepared to admit this on the evidence at our disposal, no specific influence on the genital sphere should be expected. Its influence on metabolism I am not qualified to discuss.

3. *Important problems awaiting solution.* Although so much work has been performed on the various problems mentioned in this paper, no definite explanations have been given to some of the most important phenomena which bear upon the question. Before our knowledge of the female sex organs can be considered at all satisfactory, we must know whether maturation of the Graafian follicle causes procœstrum. The cause of ovulation, although we now know the important factors which favor its production, is likewise unclear. We are no nearer than before to the cause of the persistence of the corpus luteum in pregnancy. Various authors report discordantly upon even such an apparently simple problem as to which of the constituents of the ovary survive transplantation. The chemistry of the sex cycle, the metabolic changes resulting after castration, the effect of lactation on the ovary, all offer a fertile field for further research.

4. *Practical results.* In conclusion I would like to emphasize the great influence that animal experimentation has exerted, and will continue to exert upon practical clinical work. The research of Hitchman and Adler (77) was foreshadowed by Heape's investigation on monkeys. Such problems as the relation of ovulation to menstruation promise to be solved by investigations upon animals. We are just beginning to realize that many meno- and metrorrhagias are due to ovarian disturbances and not to uterine disease. Here the functional importance of the corpus luteum will assume more and more weight. Probably certain classes of amenorrhœas will be found to be due to the persistence of the yellow body. Sterility, likewise, in most cases can no longer be accounted for upon a mechanical basis; perhaps a lack of coincidence of ovulation with the procœstrous and œstrous changes and consequent disturbance of the critical period during which a maternal placenta can be formed will prove to be the explanation. The great discordance of results obtained from ovotherapy are accounted for by experiment, just as the limitations of ovarian transplantation are made apparent by this method of research.

It has been difficult to select impartially

the most important facts known to us, and to arrange them in logical sequence. Necessarily many omissions have occurred, and perhaps my personal views have tinged the discussion to some degree. Time and work will doubtless produce further increase in knowledge with consequent changes in our viewpoint. If, to-day, I have succeeded in presenting the question from the physiologist's standpoint, I shall feel satisfied with my efforts.

BIBLIOGRAPHY

1. Cushing, H. and Goetsch, E. Concerning the Secretion of the Infundibular Lobe of the Pituitary Body and Its Presence in the Cerebrospinal Fluid. Am. Jour. Physiol., 1910, xxvii, 60. Believe that the secretion of the thyroid-like acini of the posterior lobe empty into the third ventricle.
2. Mayer, E. Beziehung zwischen Keimdruese und Hypophyse. Arch. f. Gynaek., 1910, xc, 600. Contains important references.
3. Loeb, L. On Progressive Changes in the Ova in Mammalian Ovaries. Jour. Med. Research, 1901, vi, 39.
4. Loeb, L. The Parthenogenetic Development of Ova in the Mammalian Ovary and the Origin of Ovarian Teratomata and Chorioepithelioma. Jour. Am. Med. Assn., 1911, lvi, 1327.
5. Von Baer. De Ovi Mammalium et Hominis Genesi Epistola, Lipsiae, 1827. (From Marshall.)
   Clark, J. G. The Origin, Growth and Fate of the Corpus Luteum as Observed in the Ovary of the Pig and Man. Johns Hopk. Hosp. Rep., 1899, vii, 181.
6. Bischoff, T. L. G. Entwicklungsgeschichte des Kaninchencies. Braunschweig., 1842. (From Marschall.)
   Sobotta, J. Ueber die Bildung des Corpus Luteum beim Meerschweinchen. Anat. Hefte., 1906, xxxii, 89. Also über die Bildung des Corpus Luteum bei der Maus. Anat. Anz., 1895, x.
7. Sandes. The Corpus Luteum of Dasyurus Viverrinus with Observations on the Growth and Atrophy of the Graafian Follicle. Proc. Linnean Soc., New South Wales, 1903, xxviii, 364.
8. Bischoff, T. L. G. Proofs that the Periodic Maturation and Discharge of Ova are in the Mammalia and Human Female Independent of Coition as a First Condition of their Propagation. Translated by Gillman and Tellkampf, Wm. Wood, 1847.
   Bouin, P. and Ancel, P. Sur le Follicle de Graaf mur et la Formation du Corps Jaune Chez la Chienne Compt. rend. Soc. de biol., 1908, lxv, 314.
9. Seitz. Die Follikelatresic waehrend der Schwangerschaft, etc. Arch. f. Gynaek., 1906, lxxvii, 203.
   Loeb, L. Ueber die Entwicklung des Corpus Luteum beim Meerschweinchen. Anat. Anz., 1906, xxviii, 102.
10. Frænkel, E. Die Interstitielle Eierstocksdruese. Arch. f. Gynaek., 1905, lxxv, 443.
11. Lane-Claypon. On Ovogenesis and the Formation of the Interstitial Cells of the Ovary (Rat). Jour. Obst. and Gynec. Brit. Emp., 1907, xi, 265. Also Proc. Roy. Soc , Series B., 1906, lxxvii, 525. (Rabbit.)
12. Wallert, J. Untersuchungen ueber das Corpus Luteum und die interstitielle Eierstocksdruese waehrend der Schwangerschaft. Ztschr. f. Geburtsh. u. Gynaek., 1906, lxiii, 520.
13. Regand, C. et Dubreuil, G. Nouvelles Recherches sur les Modifications de la Glande Interstitielle de l'ovaire Consecutive a L'isolement et la Cohabitation Avec le Male. Compt. Rend. Soc. de Biol., 1909, lxvii, 348. These authors found that the gland increased in the rabbit during the spring months and when cohabitation was allowed. It decreased during the winter months and when the doe was isolated.
14. Heape, W. The Sexual Season of Mammals and the Relation of Procestrum to Menstruation. Quart. Jour. Micr. Sc., 1901, xliv, 1.
15. Marshall, F. H. A. The Physiology of Reproduction, London, 1910.
16. For instance, the growth of horns noted in the stag.
17. Ancel, P. et Bouin, P. Rut et Corps Jaune Chez la Chienne. Compt. rend. Soc. de biol., 1908, lxv, 365.
18. Heape, W. Menstruation of Semnopithecus Entellus. Phil. Tr. B., 1894, clxxxv, 411. Heape's observations deal with the time relations existing between menstruation and ovulation. In 42 s. entellus with menstruating uteri not one showed recent ovulation. The presence of maturing follicles is not described in detail. Also, Menstruation and Ovulation of Monkeys and the Human Female. Tr. Obst. Soc., London, 1899, xl, 161.
19. Retterer, E. Sur les Modifications de la Muqueuse Uterine a L'épopque du rut. Compt. rend. hebd. de sc. et med. soc. biol., 1892, xliv, 637.
20. Loeb, L. Zur Analyse der Wachstumsbedingungen des Muetterlichen Teiles der Placenta beim Kaninchen. Arch. f. Entwicklungsmechn, 1909, xxvii, 463.
21. Bouin, P. et Ancel, P. Sur les Fonctions du Corps Jaune gestatif. 1. Sur le Determinism de la Preparation de l'uterus a la fixation de L'oeuf. Jour. de physiol. et pathol. gen., 1910, xii, 1.
22. Loeb, L. The Function of the Corpus Luteum, etc. Med. Rec., N. Y., 1910, June 25th.
23. Marshall, F. H. A. and Jolly, W. A. The Nature of the Ovarian Influence upon the Uterus as Illustrated by the Effect of Excision and Grafting of Ovaries. Edinb. Med. Jour., 1907, xxi, 219.
   Jentzer, A. and Beuttner, O. Experimentelle Untersuchungen zur Frage der Castrationsatrophie. Ztschr. f. Geburtsh. u. Gynaek., 1900, xlii, 66. For review of castration effects see Muenzer, A. Ueber die innere Sekretion der Keimdruesen. Berl. klin. Wchnschr., 1910, xlii, 2052. Tandler J. und Grosz. Ueber den Einfluss der Kastration auf den Organismus. Arch. f. Entwicklungsmechn, 1910, xxix, 290.
   Martin, F. H. Transplantation of Ovaries. Surg., Gynec. and Obst., 1908, vii, 7. For full literature see Sauvé, L., Les Greffes Ovariennes, Paris, 1909.
24. Bond, J. C. Some Points in Uterine and Ovarian Physiology and Pathology in Rabbits. Brit. Med. Jour., 1906, ii, 121.
25. Villemin. Le Corps Jaune Considéré Comme Glande a Sécrétion Interne de l'ovaire, Paris, 1908.
26. Leopold u. Miranoff, M. Beitrag zur Lehre von der Menstruation und Ovulation. Arch. f. Gynaek., 1894, xlv, 506.

LEOPOLD, G. u. RAVANO, A. Neuere Beitræge zur Lehre von der Menstruation und Ovulation. Arch. f. Gynaek., 1903, lxxxiii, 566.

HEGAR, K. Studien zur Histogenese des Corpus Luteum und seiner Rueckbildungsproducte. Arch. f. Gynaek., 1910, xci, 530.

27. REGAND, C. et DUBREUIL, G. Existe-t-il des Rélations Entre les Phénomenes du rut et la Présence du Corps Jaune Ovarien Chez les Lapins. Compt. rend. Soc. de biol., 1908, lxiv, 176.

28. EIMER. Ueber die Fortpflanzung der Fledermaus, Zool. Anz., 1879, ii, 425.

BENECKE, B. Ueber Reifung und Befruchtung des Eies bei der Fledermaus, ibid., 304.

VAN DER STRICHT, O. La Structure de L'oeuf des Mamifères. Arch. de biol., 1905, xxi, 1. Also, L'atrésie Ovulaire et L'atrésie Folliculaire du Follicle de Graaf dans L'ovaire du Chauve-souris. Verhandl. d. anat. Gesellsch. in Bonn., 1901, xv, 108.

29. HEAPE, W. Ovulation and Degeneration of Ova in the Rabbit. Proc. Roy. Soc., B. 1905, lxxvi, 260.

30. LOEB, L. Ueber die Bedeutung des Corpus Luteum fuer die Periodizitaet des sexuellen Zyklus beim Weiblichen Saeugetierorganismus. Deutsch. med. Wchnschr., 1911, xxxvii, 17.

31. In a large number of isolated white rats used for other experiments corpora lutea in all stages were regularly encountered by me. A series of rats in which the fresh corpora lutea were found postpartum is referred to later in this paper.

32. PFLUEGER. Ueber die Bedeutung und Ursache der Menstruation. Berlin, 1865. (From Marshall.)

33. STRASSMANN. Beitræge zu der Lehre von der Ovulation, Menstruation und Conception. Arch. f. Gynaek., 1896, lii, 134.

34. GOLTZ. Ueber den Einfluss des Nervensystems auf die Vorgaenge waehrend der Schwangerschaft und des Gebaerakts. Pflueger's Arch., 1874, ix. (From Marshall.)

35. KNAUER. Die Ovarientransplantation. Experimentelle Studie. Arch. f. Gynaek., 1900, lx, 332.

36. CRAMER, H. Die Transplantation Menschlicher Ovarien. Muenchen. med. Wchnschr., 1906, liii, 1906.

37. HALBAN. Ueber den Einfluss der Ovarien auf die Entwicklung des Genitals. Monatschr. f. Geburtsh. u. Gynaek., 1900, xii, 496.

38. MARSHALL, F. H. A. and JOLLY, W. A. The Nature of the Ovarian Influence upon the Uterus as Illustrated by the Effects of Excision and Grafting of Ovaries. Edinb. Med. Jour., 1907, xxi, 219.

39. BEARD. The Span of Gestation and the Cause of Birth. Jena, 1897. See Anat. Anz., 1897, xiv, 97.

40. FRÆNKEL, L. Die Funktion des Corpus Luteum. Arch. f. Gynaek., 1903, lxviii, 438.

41. LOEB, L. Production of Deciduomata and the Relation between the Ovaries and the Formation of the Decidua. Jour. Am. Med. Assn., 1908, l, 1897. The Experimental Production of the Maternal Placenta and the Function of the Corpus Luteum. Ibidem, 1909, liii, 1471.

42. NISKOUBINA. Recherches Experimentelles sur la Fonction du Corps Jaune. Compt. rend. Soc. de biol., 1908, lxv, 769. Finds the process of regression in rabbits' corpus luteum beginning on the 15th day and concludes that its physiological rôle ceases abruptly at that time.

43. FRÆNKEL, L. Neue Experiments zur Funktion des Corpus Luteum. Arch. f. Gynaek., 1910, xci, 705.

44. LOEB L. and HUNTER, J. W. Experiments Concerning Extrauterine Pregnancy and the Influence of Operation on the Course of Pregnancy. Univ. Penn. Med. Bull., 1908, x, 294.

45. DAELS, F. On the Relations between the Ovaries and the Uterus. Surg., Gynec. and Obst., 1908, vi, 153.

46. MANDL, L. Beitræge zur Kenntnis der Funktion der Weiblichen Keimdruese. Beitr. z. Geburtsh. u. Gynaek., 1903, i, 327.

47. MARSHALL and JOLLY. Contributions to the Physiology of Mammalian Reproduction. Part II. The Ovary as a Gland of Internal Secretion. Phil. Tr., B., 1905, cxcviii, 99.

48. WILLIAMS, J. W. Discussion of Webster's Paper on a Specimen of Ovarian Pregnancy. Tr. Am. Gynec. Soc., 1904, xxix, 65.

49. RITTER, F. Deciduzaellen und ihre Bedeutung. Beitr. z. Geburtsh. u. Gynaek., 1910, xv, 226.

50. LOCKHEAD, J. and CRAMER, W. The Glycogenic Changes in the Placenta and the Fœtus of the Pregnant Rabbit. A Contribution to the Chemistry of Growth. Proc. Roy. Soc., B., 1908, lxxx, 263.

51. WILLIAMS, W. L. Veterinary Obstetrics Including the Diseases of Breeding Animals. Ithaca, 1909.

52. BOUIN, P. et ANCEL, P. Sur les Homologies et la Significations des Glandes a Sécrétion Interne de L'ovaire. Compt. rend. Soc. de biol., 1909, lxvii, 464.

53. FRÆNKEL, L. Die Interstitielle Eierstocksdruese. Berl. klin. Wchnsch., 1911, No. 2. See also Limon M. Etude histologique et histogénique de la glande interstitielle de l'ovaire. Arch. d'anatom. micr., 1902–3, v, 155.

54. IWANOFF, E. La Fonction des Vesicules Seminales et de la Glande Prostatique dans L'act de Fecondation. Jour. de Physiol. et Pathol. gén., 1900, ii, 95.

55. ASKANAZY, M. Die Resultate der Experimentellen Forschung ueber Teratoide Geschwuelste. Wien. med. Wchnschr., 1909, No. 43 and 44, 2518 and 2578.

56. FOGES, A. Beitræge zur Beziehung von Mamma und Genital. Wien. klin. Wchnschr., 1908, xxi, 137.

57. RIBBERT, H. Ueber Transplantation von Ovarium, Hoden und Mamma. Arch. f. Entwcklngsmechn., 1898, vii, 688.

58. HALBAN, J. Die innere Sekretion von Ovarium und Placenta und ihre Bedeutung fuer die Funktion der Milchdruese. Arch. f. Gynaek., 1905, lxxv, 353.

59. BASCH, K. Ueber Experimentelle Ausloesung von Milchabsonderung. Monatschr. f. Kinderheilk., 1909, viii, 513.

60. LANE-CLAYPON, J. E. and STARLING, E. H. An Experimental Enquiry into the Factors which Determine the Growth and Activity of the Mammary Gland. Proc. Roy. Soc., 1906, B., lxxvii, 505.

61. FRANK, R. T. and UNGER, A. To Appear in the Arch. of Int. Med., June, 1911.

62. FOÀ, C. Sui Fattori che Determinano L'ascrescimento e la Funzione Della Ghiandola Mammaria. Arch. di Fisiologia, 1908, v, 520.

63. BIEDL, A. u. KOENIGSTEIN, R. Untersuchungen ueber das Brustdruesenhormone der Graviditaet. Zeit. f. Exp. Pathol. u. Therap., 1910, viii, 358.

64. BOUIN, P. and ANCEL, P. Recherches sur les Fonctions du Corps Jaune Gestatif., ii. Sur le Determinism du Developpement de la Glande Mammaire au Cours de la Gestation. Jour. de Physiol. et Pathol. gén., 1911, xiii, No. 31. Ovulation was induced by permitting coitus with a male, whose vasa defferentia had been ligated. The does were killed at various periods after coitus.

65. Aschoff, L. Zur Morphologie der Lipoiden Substanzen. Ziegler's Beitr., 1910, xlvii, 10.
66. Wallert, J. Chemische Untersuchungen ueber den Luteingehalt des gelben Koerpers waehrend der Graviditaet. Beitr. z. Geburtsh. u. Gynaek., 1909, xiv, 149.
67. Ciaccio, C. Beitrag zum Studium der Zellipoide in Normalen u. Pathologischen Verhaeltnissen und einer Besonderen Entartung von Lipoidem Typus. Centralbl. f. Pathol. Anat., 1909, xx, 771.
68. Miller, J. B. Die Rueckbildung des Corpus Luteum. Arch. f. Gynaek., 1910, xci, 263.
69. Koblanck, A. u. Loeb, W. Uber ein Peptidspaltendes Enzym der Ovarien. Biochem. Zeitschr., 1910, xxix, 102.
70. Bouin, P. u. Ancel, P. Sur la Nature Lipoidienne D'une Substance Active Sécrété par le Corps Jaune des Mammiferes. Compt. rend. hebdom. d. séances d. l'acad. d. Sc., 1910, cli, 1391.
71. Frank, R. T. Has Ovotherapy as now Practiced an Experimental Basis? Arch. of Int. Med., 1910, vi, 314.
72. Halban, J. u. Frankl, O. Zur Biochemie des Uterus. Gynaek. Rundschau, 1910, iv, 471.
73. Loewy, A. Neuere Untersuchungen zur Physiologie der Geschlechtsorgane. Ascher u. Spiro., 1903, ii, 130, also Loewy u. Richter. Zur Wissenschaftlichen Begruendung der Organotherapie. Berl. klin. Wchnschrift., 1905, xxxvi, 1095 and 1100.
74. Neumann, S. u. Vas, B. Ueber den Einfluss der Ovariumpraeparate auf den Stoffwechsel. Arch. f. Gynaek., 1902, xv, 433. Also Neumann, Arch. f. Gynaek., 1896, li, 130.
75. McCrudden, F. H. The Effect of Castration on the Metabolism. Journ. Biol. Chem., 1910, vii, 185.
76. Neumann, J. u. Herrmann, E. Biologische Studien ueber die Weibliche Keimdruese. Wiener klin. Wchnschr., 1911, xxiv, 411.
77. Hitschmann, u. Adler, L. Der Bau der Uterusschleimhaut des geschlechtsreifen Weibes mit Besonderer Berueksichtigung der Menstruation. Monatschr. f. Geburtsh. u. Gynaek., 1908, xxvii, 1.

OVARIAN TRANSPLANTATION IN LOWER ANIMALS AND WOMEN[1]

Review of the Literature and Bibliography

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In May, 1903, I published a report of two cases of heterotransplantation of the ovaries in human females, and reviewed the literature (Chicago Medical Recorder, 1903).

In 1908, I made a further communication to the American Gynecological Society, and published it in Surgery, Gynecology and Obstetrics (vol. vii, p. 7) in which I added one case of heterotransplantation to those already reported and five homo- or autotransplantations, together with a review of the literature, bibliography, and comments.

My own experience since the last publication mentioned has been of a routine character all in autoplastic transplantation and I have been careless about keeping accurate records of these auto- or homotransplantations, a number of which I have done in the course of my work. These cases (at least six in number) as far as I have been able to ascertain, have continued to menstruate. One case operated upon in November, 1908, has conceived and aborted at six weeks. This case is not as valuable from a scientific standpoint as it would have been had I been able to obtain actual microscopical and macroscopical evidence of the conception, rather than the strongest clinical evidence.

A pedunculated fibroid complicated with bilateral infection of appendages, with large sacculation of the latter, was the condition in the above case. Myomectomy was performed and the appendages were completely enucleated en masse. Inspection of the enucleated specimen revealed an uninfected area of ovary. This was carefully sliced off and the thin surface layer was stitched in several pieces to the side of the uterus near the amputated tubes. The tubes had been tied off with plain catgut and no attempt was made to preserve a lumen. The woman menstruated regularly subsequent to the operation until the conception occurred.

To this report, I now wish to add abstracts of the work done in ovarian transplantation both in lower animals and humans by other observers together with the complete bibliography bringing the report up to the present

[1] Read before the American Gynecological Society, May 24, 1911.

time and add to this a short analysis of the reported work.

T. G. Brennan (42) reports a case of a nineteen year old girl with epileptic attacks only at the time of menstruation. Physical examination and history entirely negative.

Operation. On opening the abdomen, all pelvic organs appeared normal; some cystic degeneration of both ovaries. Radical excision of both ovaries. Transplantation of one ovary, the left, into a cavity made for this purpose in the fundus of the uterus. The uterine tissue was then closed over the ovary. Perfect recovery.

G. A. Casalis (71) reports the homotransplantation of one, the left ovary, after removing both appendages for bilateral inflammation. A piece of ovarian tissue the size of a small walnut was fairly sound and was saved — but unfortunately, was entirely separated from its pelvic connection; it was wrapped in warm saline compress, and in one minute's time the raw sectional surface was sutured directly against the denuded left border of the uterus and as close to the uterine artery as possible, by No. 1 catgut circular suture. The ovary was practically covered with peritoneum from the broad ligament.

Results. For two months no menstruation. Two and one-half months after the operation, menses appeared lasting forty-eight hours and free. Since then twenty-four to twenty-six day type menstruation has occurred regularly. In 1909 patient was examined because of peculiar "spells" at menstraution and uterus found retroverted. At uterine border was palpable an oval freely movable body size of an almond.

Remarks. The author says there appears to be little doubt that the premenstrual attacks were due to defective ovarian secretion, probably the forerunner of an early surgical menopause occurring in a neurotic young woman. The ovary is undergoing retrogressive changes and doubtless ere long will be useless. Successful, however, for four years.

L. Sauvé (83) Abs. J. O. and G., Brit. Emp.

Sauvé finds it unnecessary to attempt to insure the vascular supply of the ovary. Carrel and Guthrie insisted upon this as a necessity for preserving the vitality of the grafted ovary. Sauvé finds that the ovary may be successfully grafted without any such precautions and he has succeeded in transplanting six ovaries successfully, five on the bare peritoneum. In three cases where he carried out his own technique the results were striking. Rabbits were the animals used for experimentation and in each both ovaries were excised. The animal was killed six months afterwards. He noted definite changes in the relations of the histological elements of the transplanted ovary. He published illustrations of sections of the normal "check" ovary and of its transplanted fellow for comparison. The primordial follicles are scantier in the grafted ovary. The Graafian follicles are likewise scantier and on the other hand greatly enlarged. They have almost the aspects of cysts. He quotes Carmichael as observing gigantic yet scanty follicles. There was noticed a predominance of corpora lutea, so much hypertrophied as to take up the greater part of the ovary.

Sauvé and Quenu report at the same time a case of transplantation in the human subject after hysterectomy for bilateral salpingitis. Nine months later Quenu removed the graft because of pain, the patient suffering afterwards with menopause symptoms. The histological examinations of the specimen showed little evidence of regeneration — in fact hardly any ovarian elements were detected.

In 1910 Sauvé (76) brings history of work done up to date and gives a résumé of the conclusions of different experimenters.

F. H. A. Marshall and W. A. Jolly state: "The cases described by Morris (1896), Dudley (1897), and Glass (1899), in which ovaries were grafted into women whose own ovaries had been previously removed, have been mentioned in our previous paper (1905). It should be noted, however, that no record has been made (at least so far as we are aware) of the further history of these cases since they were first published, and although they have been described as successful, in the absence of

postmortem examination there is no direct evidence that this was the case."

The authors add: "The case recently described by Morris (1906), in which a woman with grafted ovary (her own ovaries having been extirpated) is said to have become pregnant and given birth to a child about four years after the operation, is still more problematical. A possible explanation of this case is that a portion of one of the woman's own ovaries had been accidentally left behind at the time of the operation of removal and had subsequently undergone hypertrophy and given rise to the ovum which afterwards became fertilized, just as in the cases described by Doran. If this is true there is no need to assume that the transplanted ovary had become functional. Morris states that the woman did not menstruate until four months after the transplantation had been effected, and then menstruated at irregular periods. There is no postmortem evidence that in any of these cases the graft had been successfully attached."

HOMOPLASTIC IMPLANTATION

"The ovaries of twenty rats were excised and transplanted to another situation within the peritoneal cavity, being attached by means of a catgut stitch to the parietal peritoneum. Of these cases, the following eight may be described as entirely successful:

"1. The grafted ovaries were allowed to remain for two and a quarter months. When examined, they were found to contain follicles and ova. The follicular epithelium was normal, and groups of interstitial cells were visible in the stroma. The germinal epithelium had disappeared from the outside of the ovary. Several large cysts, lined with squamous epithelium, were also present. The ovaries were examined in the month of January, i. e., before the breeding season of the rat.

"2. The graft was here left for two months, and the rat was killed in the beginning of the breeding season. The graft contained follicles and a large number of corpora lutea of apparently different ages.

"3. This graft was left for two months, and showed, on microscopic examination, follicles, ova, and corpora lutea. The rat was killed during the breeding season.

"4. The graft was left for two and a half months, and exhibited follicles, corpora lutea, and a cyst. Killed during breeding season.

"5. Graft left for three months. Normal corpora lutea and cysts were found present. Killed during breeding season.

"6. Graft left for eight months. A few corpora lutea and follicles were present, with relatively large amount of stroma. The rat was killed in October, i. e., during the non-breeding season.

"7. Graft left for five months. The ovarian stroma was unaltered. Some luteal tissue, follicles, and cysts were also present.

"8. Graft left for six months. Showed follicles and corpora lutea.

"In seven other cases of homoplastic implantation partial success was obtained. The tissue was recognizably ovarian, but had become considerably altered. Five experiments must be described as unsuccessful, the grafted tissue either being entirely absorbed or replaced by connective tissue. Cysts were found present in each of these cases."

HETEROPLASTIC IMPLANTATION

"Six operations were performed in which ovaries were removed from one rat and implanted on the peritoneum of another.

"Two cases were attended with success.

"1. The ovaries were removed from a rat and transplanted to the peritoneum of another whose own ovaries had previously been removed. The graft was left for three and a quarter months, when the animal was killed. Examined microscopically, the graft showed ovarian stroma and corpora lutea. The two rats were possibly of the same litter, but this was not certainly known.

"2. The ovaries were removed from a rat and transplanted to the peritoneum of another whose own ovaries were not removed. The two rats were of the same litter. The graft was left for one and a half months; it contained follicles and ova. The stroma had become degenerate in places.

"Four other similar experiments, while not entirely satisfactory, met with some success. In one of these the ovaries were transplanted

to a male rat. The graft showed recognizable ovarian tissue in parts, but had undergone very considerable degeneration.

"A number of experiments were also performed in which ovaries from one rat were grafted under the skin on the anterior abdominal wall of another rat. In three such cases some success was obtained but a larger number of grafts was absorbed than when the implantation was intraperitoneal.

"It will be observed from the foregoing account of our experiments that it is possible to excise and graft ovaries in such a way that in many cases the grafts exhibit the characteristic histological features of ovarian tissue. The germinal epithelium had, however, always become absorbed in our experiments. In other cases a certain amount of degenerative change took place, only certain elements of the tissue being recognizable after the lapse of several months; thus the stroma might present its normal appearance while the follicles had disappeared, or the greater part of the graft might be composed of luteal tissue alone.

"It will further be seen that the cases of transplantation classed as successful are fewer in heteroplastic than in homoplastic implantation. Of our two successful heteroplasts, one was a graft into a rat of the same litter, while the other was possibly but not certainly a similar case.

"The maintenance of the histological characters in successful grafts points to retention by them of function, and further evidence of their functional integrity is derived from the fact that the constituents of the graft varied according to the period in the reproductive cycle at which the animal was killed. At the commencement of the breeding season large follicles were found in the graft; at a later period corpora lutea were present. It is to be presumed, therefore, that the grafts passed through the same phases of functional activity as normal ovaries."

CONDITION OF UTERUS AFTER OVARIAN TRANSPLANTATION

"We examined the histological condition of the uterus in those cases where the ovaries had been removed and transplanted to another position in the body. The appearance of the uterus was found to bear a relation to the microscopic structure of the graft. If the latter had retained unaltered, or with little alteration, the typical characters of ovarian tissue, the uterus was found undegenerated; thus in experiment eight of our series of homoplasts in which the ovaries had been transplanted for six months, the uterus was normal. If however, the graft had failed to 'take,' the uterus exhibited undoubted evidence of degeneration. Where the graft had been successful, on examining it and the uterus postmortem, we found that each organ had the same appearance appropriate to the time of year and stage of reproductive cycle at which the animal was killed. Thus in one case where the graft had met with some measure of success, and the animal was killed at the beginning of the breeding season, the ovary contained large follicles and the uterus was in the condition which has been described as the recuperative stage of the œstrous cycle.

"In the case of transplantation from rat to rat, uterine degeneration was found, as in homoplastic implantation, to be arrested by a successful graft."

GENERAL CONCLUSIONS

"In our previous paper (1905) we supplied evidence in support of the view that heat and menstruation are induced either directly or indirectly through the activity of an internal secretion of hormone arising in the ovaries, while we adduced further evidence that the corpus luteum provides a secretion, which assists in the nourishment of the embryo during the first stages of pregnancy. In the present paper we show that the existence of ovarian tissue is an essential factor in normal uterine nutrition; and further that the nature of the ovarian influence upon the uterus is chemical rather than nervous, since the transplanted ovaries, while still maintaining their functions (at least in many cases), had lost their normal nervous connections. It is extremely probable, therefore, that the uterus is dependent for its proper nutrition upon substances secreted by the ovaries, not merely at the heat periods and during pregnancy,

when they show their greatest activity, but throughout the whole of the œstrous cycle."

Pankow (65) reports the history of a case in which an autotransplantation of the ovaries had been performed three and a quarter years before. Patient came back complaining of the same symptoms. Menstruation reappeared three months after operation.

Laparotomy. Cystic degeneration of the ovaries. Total hysterectomy. Microscopic examination of ovaries showed existence of cortex and medulla normal and also corpora lutea, albicantia, and candicantia. Primordial follicles present.

This author states that this is the first anatomical proof of the function of a reimplanted ovary.

He then reports the postoperative history of two other cases. In one the ovary was engrafted into the thigh. Menses stopped one and a half years after operation. In the other the ovary was engrafted into a peritoneal pocket between bladder and uterus. Menses very irregular. Very serious painful attacks in region of bladder at time of menstruation.

His clinical indications were: Metrorrhagia in four cases. One case metrorrhagia and dysmenorrhœa. One case dysmenorrhœa. One case osteomalacia.

As to the results the author states that they are not very encouraging. Especially the cases with dysmenorrhœa did not show any relief of their trouble.

Menses reappeared in all cases but were painful and troublesome. Atrophy of the genital organs, obesity, and vasomotor disturbances did not occur. Author thinks that analagous to experiments made by Jandler and Gross with testicles, the ovaries contain two secreting tissues, the one in intimate relation to menstruation, the other to general nutrition of the body. By using X-ray one of these tissues can be destroyed. He therefore put, in his last two cases, the ovaries after extirpation into normal salt solution and applied the X-ray for ten minutes at a distance of twenty-five cm. and then reimplanted them. Cases too recent to report result.

Brewitt (62) reports a case of a twenty-three year old girl with infantile uterus, atrophy of ovaries. Never has menstruated.

Implantation of a normal ovary from a woman shortly before her menses in the left breast. Two days after operation menstruation set in and lasted five days.

G. Burckhard (63) transplanted ovaries into the testicles of guinea pigs.

His object was to determine whether these glands would under those conditions of intimate contact influence each other in their respective functions, and to gain, if possible, some information in regard to the development of the embryo. The result of his experiment was negative. Both ovaries and testicles in a very short time showed degenerative changes.

In the ovaries the Graafian follicles were first affected. Hyaline degeneration of the epithelium and ova, thickening of the zona pellucida, infiltration with leucocytes, complete atrophy of follicle in fourteen to fifteen weeks. Primary follicles disappeared in twenty-four weeks.

The blood supply of the engrafted organ was very insufficient, only very few newly formed vessels would be demonstrated. Similar changes took place in the testicles. Pronounced leucocytic infiltration. The explanation of these processes is probably a pressure necrosis or chemical process. Disturbances in the circulation and leucocyctic influence may be factors.

F. H. A. Marshall and W. A. Jolly (85) in 1908 report further their results in heteroplastic ovarian transplantation compared with those produced by transplantation in the same individual, in which they state:

"Greater success attends transplantation of the ovaries into the kidney than onto the peritoneum, probably on account of the greater vascularity of the kidney.

"Homoplastic transplantation of ovaries is very considerably easier to perform successfully than heteroplastic transplantation. This fact can scarcely be ascribed to difference in the technique of the two operations since this was identical in each experiment, the two animals being operated upon simultaneously in the case of the heteroplastic transplantations.

"Heteroplastic transplantation of ovaries is apparently easier to perform successfully when the two animals employed in the experiment are near relatives of each other. In our experiments there were few exceptions to this rule.

"The presence of an animal's own ovaries does not seem to exert any inhibitory influence on the successful attachment and growth of additional ovaries obtained from another individual.

"The presence of a successfully grafted ovary in an abnormal position in the body, whether obtained from the same or from another individual, is sufficient to arrest the degenerative changes which habitually take place in the uterus after the complete extirpation of the ovaries, as other experiments have shown. It may be concluded therefore, that the ovarian influence on the uterus is chemical rather than nervous in nature."

Mauclaire (66) in 1908 gives a short history of work done in regard to transplantation of ovaries. Experiments on animals leave no doubt as to the success of this operation.

In the human the results are not doubtful, although not very many cases have been reported. Some authors believe that the persistence of menstruation after a double ovarectomy is due to the existence of a third supplementary ovary. Personally, the author states, he has never seen in from sixty to eighty cases, a recurrence of the menstruation after double ovarectomy. Some exceptions exist however, since Gellhorn reports a case of this kind. Second laparotomy revealed numerous adhesions between uterus and appendices epiploicæ. After cutting these adhesions, the menstruation disappeared.

Author then reports 19 cases with short histories of autotransplantation. He concludes that beyond the slightest doubt, ovarian autotransplantation is a possible and successful operation as demonstrated by histological examination.

In regard to heterotransplantation author reports thirteen cases. He states that a transplantation of an ovary into the broad ligament is justifiable. As clinical indications he enumerates:

For autotransplantation:

1. Neuropathic disturbances which are likely to follow a bilateral ovarectomy.

2. Obesity, which often comes on after such an operation.

For heterotransplantation:

3. The desire of the patient to have offspring.

In his conclusions, he agrees with the writer, that these operations are without danger; that we are able to prevent the disturbances following castration; that menstruation can continue after autotransplantation; that conception has occurred after auto- and heterotransplantation in animals as well as in humans.

Mauclaire in this article speaks of the large number of failures in the operation of ovarian transplantation. He thinks that this is due to the insufficient blood supply to an organ already deprived of its nervous supply. To relieve that he establishes a vascular connection between the engrafted organ and the epigastric artery. Reports one case. He did not want to handle the organ too much for fear of sepsis. But to be complete, one would also have to anastomose the veins.

In conclusion, positive results in animals are numerous.

In the human, results are good, if ovaries are grafted into peritoneum or subcutaneously. In heterotransplantations, more care should be given to the establishment of a sufficient blood and nerve supply.

In 1909, Mauclaire (67) reports two additional autotransplantations in which he transplanted the ovary into the subcutaneous tissue and established sufficient blood supply by anastomosing the epigastric artery with one of the ovarian vessels, probably artery to vein.

In the first case the operation was successful, having invaginated the epigastric artery into an ovarian blood-vessel of a greater caliber and using very fine needles preserved in sterile vaseline.

The second case was unsuccessful. Here a hæmatone developed. But both cases are too recent to allow of any conclusions.

H. T. Cramer (90) states that the success of a transplantation depends upon the resistance of the tissue to be used.

The ovaries are especially adapted for that purpose since the cells are the least differen-

tiated and because the ovaries being glands with internal secretions, are independent as to location. Nevertheless some precautions are imperative. We know that the peripheral parts of a transplanted part are more liable to resist than the central part which readily undergoes degenerative changes, the reason being that blood-vessels do not develop before the third or fourth day. To avoid that, Cramer splits the ovaries before implanting them and has had good results from this method. Furthermore, it is evident that too long a time should not elapse between the two procedures. In heterotransplantation both laparotomies should be done at the same time. In autotransplantation, hot normal salt compress should be used. As to the place for implanting the ovaries, Cramer looks for the most vascular place. He thinks the preperitoneal space between and underneath the rectus muscle the best; also the subserous tissue on the anterior uterine wall between uterus and bladder. Finally, in cases of heterotransplantation, the age of the individual is of importance, the younger the better. Animal experiments go to show that after the menopause results are seldom or never to be obtained.

Tuffier (91) presents a case of a woman twenty-six years of age, in which he had removed six months previous to the time he reports it, both ovaries and tubes, but left the uterus. He at the same time implanted part of one ovary into the subcutaneous tissue of the abdomen. Five months later regular menstruation appeared. He believes that the ovaries do not play such an important rôle in regard to menstruation, but believes that menstruation is due to the internal secretion of some, as yet unknown, gland. He also believes, that the symptoms preceding the menopause are of the type of hyperthyroidism which are normally neutralized by the internal secretion of the ovaries. In the case presented all those symptoms were present in the five months necessary for the development of the reimplanted ovary, after which time they promptly disappeared.

William L. Estes (86) reports two pregnancies following implantation of the ovaries, implantation, however, being only partial in nature, as the operator is extremely careful to retain some small part of the original permanent attachment.

Technique of the operation. In cases in which the necessary manipulations are not apt to prove dangerous on account of a possible rupture of an abscess into the peritoneal cavity, after careful bathing and disinfecting the vulva and vagina, the uterus is curetted, washed out, and packed with iodoform gauze. The abdomen is then opened; after carefully protecting the general abdominal cavity with warm moist towels, while the woman is in the Trendelenburg position, the adhesions are broken up, the tubes carefully liberated, and all pus and detritus sponged out, and the pelvis dried and packed with gauze. The tubes are completely exsected from the horns of the uterus by rather a free oval incision which reaches to the mucous membrane. As a rule in pus cases, the broad ligament is so thickened and softened and so adherent to the tubes that a mass ligature is passed around the upper folds of the broad ligament, outside the tube, and the ovarian vessels tied off. After this, all the involved upper part of the broad ligament is removed with the tube, including the uterine insertion. Frequently it is necessary to cut through the uterine attachment of the round ligament in order to get rid of all the infected tissues. Both tubes are treated in like manner. The ovaries will probably have been liberated in the separation of the tubes and the evacuation of the abscess cavities. If not fully liberated, they should now be freed and carefully examined. Then all the degenerated part of the ovaries should be exsected, by cutting, if possible, from the lower unattached part of the organs. The ovarian ligament should be preserved, if practicable, with its small artery, and the attachments to the broad ligaments also, if it can be done without leaving bad tissue behind. This is not essential, however, as completely exsected portions of the ovarian stroma may be implanted. The portion of the ovarian stroma which is left is cut in such a pattern that it will fit into the oval concavity left in the horn of the uterus when the tubes are

exsected. These portions should be successively drawn over, placed with their raw surface into the oval concavities in the horns of the uterus, and fastened in place in the uterine walls by running sutures of No. 1 chromicized catgut all around their edges. The stumps of the round ligaments and broad ligaments are then brought into apposition with the sides of the uterus in such a way that the implanted segment of ovary is entirely covered by the serous membrane of these ligaments. This serves the double purpose of steadying and fixing the uterus in position, and protects the grafts from possible adhesions to the intestines or omentum.

T. Tuffier and Chapman (73) report that one of them has been making a study during the last few years of the question of ovarian grafting in the female subject. The graft consists in implanting under the skin of the abdominal wall, one of the ovaries which has been removed at a subtotal hysterectomy. The question of grafting an ovary from one woman into the abdominal wall of another subject and also of grafting an ovary which has been preserved in ice during a period of one to twenty-five days has also been studied. In all these cases the grafting has been successful. The ovary has retained its original size for a period varying from one month to three years and has exhibited at different times, certain congestive phenomena which have simulated those which normally take place just prior to menstruation. The result of these inquiries have been published in a thesis by Scheurer.

They have been unable to formulate any definite conclusions as to whether it is possible for an ovary buried beneath the skin with a uterus to present the phenomena associated with menstruation. In the case given below normal menstruation occurred, accompanied by enlargement of the ovary which had been implanted four and one half months before.

Age 29. One child. Tubes and ovaries removed for pain and infection. Right ovary normal, was grafted into abdominal wall on right side. Operated December 10, 1909. Reported May 4, 1910. Swelling over seat of ovary coincident with vaginal discharge. April 26, vaginal blood, swelling of ovary.

Tuffier ventures no hypothesis regarding the nature of this menstruation. The ovary is under the influence of a toxin the origin of which is unknown but whose action is elective on the ovary; the toxin produced an intense congestion of ovary. An internal secretion thus is thrown into the blood by the ovary and menstruation is stimulated. In this case the menstruation was scant until blood menses were fully developed in the new graft, then free.

Nattrass (80) reports nine experiments made to see the effects of autoplastic transplantation on the ovary and its functions, in other words, to note what happens when that organ is excised and grafted onto other parts of the same subject. These experiments were made upon rabbits, ether being used as the anæsthetic. He did not lose a single rabbit.

He successfully grafted the ovary on the external oblique, so as to be subcutaneous, and onto the peritoneum, kidney, spleen, periosteum, and external intercostal muscles. When examined shortly after the transplantation fatty degeneration of the cells of the stroma was detected, causing the organ to become slightly swollen. The degree of swelling was in inverse ratio to the vascularity of the tissues onto which the ovary was transplanted, being most marked in the subcutaneous and least in the splenic grafts. When examined later after the transplantation, the ovary was found diminished in size. There was an increase in amount of fibrous tissue, and progressive absorption and repair of pathological products, and a continued development of egg cells, and production and maturation of Graafian follicles, although never to the same degree as in the ovary before transplantation. The graft becomes firmly adherent to the adjacent tissues by dense fibrous bands, plainly discernible by the fourteenth day. At first, the graft is nourished by transudation of fluid from the lymph spaces of the adjacent tissue, hence the periphery of the ovary, the egg bearing part, always retains its vitality. Ultimately blood-vessels become developed and vascular

union established, the graft thus receiving blood from the arterial system. The ninth experiment was on a fox terrier bitch. Its ovaries were removed from the abdominal cavity. The right ovary was fixed subcutaneously on the right external oblique muscle and the left was placed in the sheath of the left rectus abdominis. The ovaries were examined 370 days later, the animal being watched for a year. Œstrum was observed three times with sanguineous discharge and vulvovaginal congestion and inclination towards the male. Hence the transplanted ovaries continued to carry on their functions as organs of internal secretion and to regulate the sexual life of the animal. The ovaries in this case showed no evidence of fatty degeneration, and contained some large Graafian follicles, and a great number that were smaller and altered in shape, their sides being pressed together in such a way that the cells of the membrane granulosa were arranged as columns or cylinders.

Nattrass believes that his experiments prove that autoplastic transplantation of the ovary might be practiced even with greater success in gynecological surgery. It can be performed with ease and rapidity without prolonging the operation for more than a few minutes. The ninth experiment showed that the grafted ovary continues to control the sexual life of the individual. In instances where it is desired to induce sterility, for deformed pelvis for example, transplantation seems an alternative to the present method of treatment. In hysterectomy and ovarian disease grafting may prove very valuable. Yet Nattrass considers that heteroplastic grafting has not so wide a field of usefulness as homoplastic grafting, that is, transplantation of an ovary from another subject of the same species.

CONCLUSIONS

1. Autotransplantation of the ovaries or a portion of the ovaries, as a practicable operation which can be performed successfully and expeditiously with a simple technique by any surgeon of ordinary ability and training is now well demonstrated by the work of many observers as shown in the literature.

2. Transplantation of the ovaries or a portion of the ovaries is successfully accomplished by attaching or imbedding the cut surface of the graft onto or into a well nourished tissue (the horn of the uterus, the broad ligament, the parietal peritoneum, or even imbedded in the muscles of the abdominal wall or the subcutaneous tissue anywhere) without the necessity of blood-vessel anastomosis.

3. It seems to be established that a small portion of ovary successfully engrafted anywhere furnishes to the subject of the graft the secretion or influence which preserves her sexuality, and prevents atrophy of the genital organs and other changes in the individual that are coincident with complete castration.

4. The same technique in heterotransplantation of ovaries, even in individuals of the same species, does not give such uniformly successful results as does homotransplantation, owing to a peculiar heterogeneity that our experiments have demonstrated, but the character of which we do not know, except that individuals of close consanguinity appear to be less antagonistic to grafts one to the other.

5. My work and the work of Mauclaire, Marshall, Jolly, Sauvé, and Casalis and others on human females and the work of Pankow and Sauvé on animals clearly demonstrates that there is a definite antagonism between the blood or the tissues of one individual and that of another to an ovarian graft.

6. The work of Pankow and Sauvé seems to show that this lack of homogeneity of conditions exists less between animals closely related by consanguinity.

7. On the other hand, my experience and the reported work of Casalis, Sauvé, Marshall and Jolly, Mauclaire, Pankow, and others demonstrates that there is practically no antagonism between the blood or tissues of an individual to ovarian grafts from her own ovaries.

8. As to the lack of success in transplanting ovaries from one individual of the same species to another is not one of technique apparently, but one of tissue or blood antagonism, will it be possible for us by some process of preparation of patients to render the blood or the tissues of the donor and recipient homoge-

neous and thus make more successful tissue transplantation?

BIBLIOGRAPHY

1. Morris. N. Y. Med. Jour., Oct., 1895.
2. Knauer. Centralbl. f. Gyn., 1896, xx, 524.
3. Knauer. Centralbl. f. Gyn., 1897, xxi, 842.
4. Knauer. Centralbl. f. Gyn., 1898, xxii, 201.
5. Griegorieff. Centralbl. f. Gyn., 1897, xxi, 663.
6. Jayle. Bull. Soc. Anat. de Par., 1897, lxxii, 641.
7. B. Marchese. Archiv. Ital. di. gin. e. Obstetr., 1898.
8. Ribbert. Arch. f. Entwickelungsmechanik, 1898, vii, 688.
9. Arendt. Centralbl. f. Gyn., 1898, xxii, 1116.
10. Trans. Soc. Obstet. and Gyn., Cologn., Jan. 14, 1898.
11. Frank. Centralbl. f. Gyn., 1898, xxii, 444.
12. Knauer. Centralbl. f. Gyn., 1898, xxii, 1257.
13. Fish. Annals Gyn. and Ped., 1898–9, xii, 379.
14. Rubenstein. St. Petersb. med. Wochenschr., 1899, xxix, 281.
15. A. Palmer Dudley. Trans. Intern. Gyn. Cong., Amsterdam, 1899.
16. Knauer. Wien. klin. Wochenschr., 1899, xii, 1219–1222.
17. Glass. Med. News, N. Y., Apr. 29, 1899, 523.
18. McCone. Amer. J. O. and Dis. of Women and Children, 1899, xl, 214.
19. Preobrashenski. J. akush. i. jensk. bol., St. Petersb., xiii, 1899.
20. Herlitzka. Arch. Ital. di. biol., 1900 (34), 106.
21. Mauclaire. La Gynecologie, Dec. 25, 1900.
22. Halban. Monatschr. f. geb. u. Gyn., 1900, xii, 496.
23. Dudley. Post Graduate, Apr., 1900, xl, 546.
24. Preobrashenski. J. akush. i. jensk. bol., St. Petersb., xiv, 1900.
25. Foà. Revista acad. di. Scienza Biologie, 1900.
26. Knauer. Arch. f. Gyn., 1900, lx, 332.
27. Schultz. Centralbl. f. Allg. Path. u. Pathol. Anat., 1900, xi, 200.
28. A. Palmer Dudley. Trans. Internat. Med. Cong. Par., 1900.
29. Foà. Arch. Ital. di. biol., 1901, xxxv, 364.
30. Lukaschewitz. Vratch., St. Petersb., 1901, No. 29.
31. Monprofit. Arch. prov. de Chir., 1901, No. 3.
32. Clark. Progressive Medicine, June, 1901.
33. Morris. Med. Rec., N. Y., Jan., 1901.
34. Centralbl. f. Gyn., 1901, xxv, 736.
35. Amico-Roxar. Archiv. di Obstet. e. gin., Napoli, 1901, 929.
36. A. Palmer Dudley. Jour. Amer. Med. Assn., Aug. 10, 1901, 339.
37. Morris. Jour. Amer. Med. Assn., May, 1902.
38. Nicholson. Univ. of Pa. Med. Bull., xiv, Jan., 1902, 401.
39. Baldwin. Am. Jour. Obst., 1902.
40. Schultz. Monatschr. f. Geb. u. Gyn., 1902, 989.
41. T. G. Brennan. Epilepsie Menstruelle Traitei par la Transplantation ovarienne. Rev. Med. du Canada, Montreal, 1902, xvi, 759.
42. T. G. Brennan. Gaz. de. Gynec., Par., 1903, xciii, 230.
43. F. H. Martin. Ovarian Trans. and Reconstruction of Fallopian Tubes. Chic. Med. Rec., 1903, xxvi, 12.
44. Morris. Am. Jour. Obst., xlviii, 1903.
45. Limon. Soc. de Biol., Paris, 1904.
46. Katsch. Russ. Med. Rundschau, Berlin, 1904.
47. Warbasse. Brooklyn Med. Jour., 1905.
48. Basso. Arch. f. Gyn., Berlin, 1905.
49. R. T. Morris. Case of Heteroplastic Ovarian Grafting followed by Pregnancy and Delivery of Living Child. Buffalo Med. Jour., 1906–7, lxii, 393.
50. A. Carrel and C. C. Guthrie. Technique de la transplantation homoplastique de l'ovarienne. Compt. rend. Soc. de biol., Par., 1906, lx, 466.
51. Pankow. Ueber Reimplantation der Ovarien beim Menschen. Munchen. Med. Wochenschr., 1907, liv, 441.
52. Guthrie. Proc. Amer. Phy. Soc., Boston, 1907.
53. C. C. Guthrie. Results of Transplantation of Ovaries in Chickens. Quart. Bull. Med. Dept. Washington Univ., St. Louis, 1907, 8, vi, 45.
54. C. C. Guthrie. Further Results of Transplantation in Chickens. Jour. Ex. Zoöl., Phila., 1907–8, v, 563.
55. C. C. Guthrie. Results of Ovarian Transplantation on Body-weight and Egg-weights in Fowls. Jour. Am. Med. Assn., Chicago, 1908, li, 1314.
56. F. H. A. Marshall and Jolly. Preliminary Communication upon Ovarian Transplantation and its Effects on the Uterus. Proc. Physiol. Soc., Lond., 1906, 26.
57. Morris. Med. Rec. N. Y., 1906, lxix.
58. Cramer. Deut. Med. Woch., 1906.
59. Carmichael. Jour. Obs. and Gyn. Brit. Emp., London, March, 1907.
60. Tziklici. Insuffisance ovarienne et greffe ovarienne; essai de therapeutique experimentale. Par., 1907, 131, 8°.
61. Magnus. Nersk. Mag. f. Loegevidinsk., Kristiana, 1907.
62. Brewitt. Transplantation eines Ovarium. Deutsche med. Wochenschr., Leipzig u. Berl., 1908, xxxiv, 1700.
63. Burckhard. Ein Beitrag. zur Ovarientransplantation. Transplantation von Ovarien in die Hoden. Zentralbl. f. Gynak., Leipzig, 1908, xxxii, 150. Beit. z. Path. Anat. u. z. Allg. Path., June, 1908, xliii, 499, 518.
64. F. H. Martin. Transplantation of Ovaries. Surg., Gyn. and Obs., 1908, vii, 7; Trans. Amer. Gyn. Soc., 1908, xxxiii, 489, 521.
65. Pankow. Was Lehren nus die Nachbeobachtingen von Reimplantationem der Ovarien beim Mensch. Zentralbl. f. Gynak., Leipzig, 1908, xxxiii, 1040.
66. Mauclaire. Les Greffes ovariennes avec ou sans anastomosis vasculoires chez le femme. Arch. gyn. de. Chir., 1908, ii, 571.
67. Mauclaire. Bull. et Mem. Soc. de Chir. de Par., 1909, clx, 6265.
68. Mauclaire. Bull. et Mem. Soc. de Chir. de Par., 1909, n. s., xxxv, 179.
69. Quenu and Sauvé. Un cas de controle histologique d'un greffe ovarienne humaine. Bull. et Mem. Soc. de Chir. de Par., 1909, n. s.; Rev. J. O. and G. B. E., v, xvii.
70. Walther. Greffe spontane d'un ovaire à pédicule tordu et rompu. Bull. et Mem. Soc. de. Par., 1909, n. s., xxxv, 870.
71. Casalis. Notes on a Case of Ovarian Transplantation. J. O. and G. B. E., 1909, xv, 325.
72. Scheurer. Les greffes ovariennes. Thesie de Paris, 1910.
73. Tuffier and Chapman. Ovarian Grafting and Menstruation. Brit. Med. Jour., 1910, 1543.
74. C. Daljan. The Ovarian Gland. Spitalue Bucuresci, 1910, xxx, 52.
75. Shattuck and Seligman. The Influence of Oöphorectomy upon the Growth of the Pelvis. Proc.

Royal Soc. Med., Lond., Obs. and Gyn. Sec. Path. Sec., 102.
76. SAUVÉ. Les Greffes Ovariennes. An. de gynec. et Obs. Proc., 1910, 23, vii, 155.
77. SAUVÉ. Bull. et mem. Soc. Anat. de Par., 1909, lxxxiv, 646.
78. SAUVÉ and QUENU. J. O. and G B. E., xvii.
79. NATTRASS. Autoplastic Ovarian Transplantation. J. O. and G. B. E., March. 1911, 244.
80. NATTRASS. Phys. Lab. u. Melb., June, 1910.
81. NATTRASS. Rep. Phys. Lab. Melb.; Abs. J. O. and G. B. E., March, 1911, 244.
82. ARENDT. Verhandl. d. 70, Versamme d. Deutschen Naturf. u. Aerzte.
83. SAUVÉ. Bull. de la Societe Anat. de Par., Nov., 1907.
84. MARSHALL and JOLLY. Trans. Royal Soc. Edinb., 1905–7.
85. MARSHALL and JOLLY. Quart. Jour. of Exper. Phys., i, 1908, 114.
86. W. L. ESTES. Penna. Med. Jour., 1909–10, 610.
87. LUCAS-CHAMPIONIERE. Jour. de Sages-femmes, 1907, 290.
88. LOFQUIST. Duodecim. Helsinski, 1907, xxiii, 122.
89. MEISENHEIMER. Lod. Auz., Leipzig, 1910, xxxv, 446.
90. H. T. CRAMER. Transplantation der Ovarien. Gynak. Rundschau, Berl. u. Wien, 1909.
91. TUFFIER. Greffe ovarienne et menstruation. Bull. et Mem. Soc. de Chir. de Par., 1910, 846.
92. ALGUIER. Etat de qualques glandes á secretion interne apres castration ovarienne chez me femme. Gaz. d. Hop., Par., 1910.
93. ALGUIER. Zur Trage der transplantation der Ovarien beim Menschen. Berl. Klin. Wochenschr., 1910, 112.

CONSERVATION OF THE OVARY[1]

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THE ovary, or the female sex organ, consists essentially of an aggregation of germ cells, which early in fœtal life, about the fifth week, make their appearance in the wall of the cœlom, on the mesial aspect of the Wolffian body. These germ cells are probably not formed *in situ*, by any localized metaplasia of the mesothelial somatic cells, which is the older view of their origin. On the contrary, they have probably existed from the earliest stages of the segmentation of the ovum, multiplying with the growth of the embryo, and have at this time simply become segregated in this situation. They represent in this way the continuity of the germ plasm. So segregated, a structural connection with their host is determined by the formation and ingrowth of vessels and nerves with their attendant, less differentiated somatic cells. In this way this aggregation of germ cells comes to be actually bound together into a compact nucleus or viscus, and so it is that the sex organ, or sexual gland, is formed. Further changes consist but in cell mitosis, differentiation, and growth.

At this early stage there is in this organ or gland no recognizable differentiation of sex. The recent work of John G. Clark is of special interest in this respect, as he shows that the earliest appreciable indication of this sex differentiation is to be found in the differences of blood supply to the sex organ; by this difference of blood supply is the sexual organ first to be recognized as an ovary or testicle.

These primitive germ cells, or oögonia, as they at first appear, are small, oval cells, with a deeply stained granular nucleus. They multiply rapidly by mitotic division. According to Louise McIlroy the first differentiation which takes place among them is the formation by some of these cells of a "capsular epithelium," usually designated the "germinal epithelium," the function of which is mainly protective. The greater number of these germ cells however, become arranged in rows or columns, like rows of coins, more or less perpendicular to this capsular surface; this arrangement being probably effected by the ingrowing septa of vascular somatic cells from the area of attachment to the host, namely, the hilum. These cell columns are the so-called Pflüger's tubules, or "cortical cords," concerning the origin of which there has been perpetual dispute. These columns, or cords, are first solid, but later they become tubular, saccular, and convoluted.

The increase in the size of the sex organ follows simply further intergrowth between

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these two component parts, the germ cells in columns or nests growing more deeply inward, while the somatic cells of the host radiate further outward in vascular partitions between them. So is constituted respectively the parenchyma and stroma of the sex organ.

In the testicle these tubules come to communicate with the Wolffian duct; but in the ovary, though according to Goodall they may extend down to, and even into, the hilum, this communication is not effected, and the ovary remains in the strictest sense a ductless gland.

The early maturation phases of these germ cells have been carefully studied recently by von Winiwarter, Lane-Claypon, Whitridge Williams, and Louise McIlroy, and chiefly in the embryo of the rabbit, pig, dog, cat, and the human embryo. These researches have shown that in these several mammalian types a similar plan of development is followed. That not only the oöcytes, that is, the cells destined for fertilization, but also the follicle cells, and the numerous interstitial cells of the ovary arise from the oögonia, or primitive germ cells. In fact, that the whole parenchyma of the ovary is derived from this source. The stroma cells, on the other hand, being as they are somatic cells of the host, are concerned only with support and vascularization.

The oöcytes themselves arise from the primitive germ cells by mitotic division and growth, the chief changes manifesting themselves in the size of the cell, and the chromatin distribution in the nucleus. These larger cells increase and multiply at the expense of their fellows, which remain small, and are known as "reserve cells," regressive oöcytes, follicle or interstitial cells. In their further maturation changes these primary oöcytes undergo a long synaptic phase, with only apparent reduction of their chromosome filaments, and reach the stage of the germinal vesicle or resting nucleus only at, or just after, birth. These are the ova, as they exist in the mature ovary.

The later stages of maturation, with true reduction of the chromosome filaments, only take place after extrusion of the oöcyte from the follicle. These stages are brought about by fertilization.

Follicle formation occurs early in the human ovary, before the fourth month, and the process begins in the deeper, the more highly vascularized portion of the organ. By means of serial sections Goodall has shown that these follicles are but local dilatations of the Pflüger's columns, now become tubular, and he indicates the sharp parallel that accordingly exists between these oöcyte bearing tubules in the ovary, and the spermatocyte tubules in the testicle. Karyolytic changes with the formation of syncytial masses, a pabulum for the growing oöcyte, are frequently seen in these early follicles, and McIlroy asserts that the follicle cells frequently multiply by direct division.

It is estimated that the number of ova in the human ovary at the time of birth is some hundred thousand, and that about half of this number remain at puberty. All of these ova have experienced the phases of early maturation, and the surrounding rapid cell mitosis and cell metabolism, which these phases have instigated. The whole process is one of great cellular activity, the most pronounced in the life history of the ovary. During this time, the time of greatest activity in the ovary, the primary sexual characters of its host are initiated and developed. Sex becomes definitely determined. And it is only fair to think that during such active maturation metabolism, that the existence of some internal secretion obtains, since after birth when the sex organ is comparatively quiescent, such a secretion or "hormone" is generally admitted. And as at puberty, the appearance of the secondary sexual characters of the woman depends upon the internal secretion of the ovary, and this is now common knowledge, it is only fair to suppose that in fœtal life the development of the primary sexual characters depends to some extent upon such sex gland influence. For these two reasons then, the great cellular activity and karyolytic changes which are present in the fœtal ovary, corresponding in time to the development of the primary sex characters; and the known influence in early adult life of the comparatively quiescent organ upon the occurrence of the secondary sex characters, it seems fair reasoning to

assume for the ovary of the fœtus an internal secretion.

The importance of this sex organ, or ovary, is, I think, impossible to overestimate. In a sense it is the most important in the whole body, though its removal does not mean the loss of life. For, not only is it the primary organ concerned in the reproductive cycle, but it also regulates and controls the complete attainment of development, growth, and function in the individual herself. It so perfects its own generation, while at the same time it prepares for the next. Supreme individuality is only attained through its influence; and without it, this attainment is never reached, and the individual remains imperfect and incomplete. Moreover its continual presence is essential to the maintenance of this individual or sex perfection; and its removal or disablement, even after maturity is reached, leads inevitably to descent or retrogression.

From the foregoing, sex is best understood as sex influence; an influence exerted in chief part by the sexual gland. Sex is not a single definite impress, stamped at the beginning, upon the ovum or embryo, but rather is it a continuous influence exerted throughout the whole life of the individual.

The nature of this influence, it is now recognized, is that of an internal secretion, or "hormone," and its source in the female is the parenchyma of the ovary.

It is now six years since Starling's work on the "Chemical Correlation of the Functions of the Body" appeared. During this time much experimental work upon these so-called internal secretions, or "hormones" has been done. In respect of the secretion of the ovary the following is the present-day summary of our position.

The parenchyma cells of the ovary secrete a substance (or substances) which reacts upon the general body metabolism, and controls especially the nutrition, growth, and activity of the uterus. In the words of Marshall "this secretion is formed at all times in greater or less quantity, but is produced in increased abundance at certain recurrent periods, when it brings about those conditions of growth and hyperæmia which characterize the proœstrous or menstruation processes. . . . . After ovulation, which occurs during œstrus, the secretory cells of the ovary show still greater activity, and the cells of the ruptured follicle become converted, largely by a process of simple hypertrophy, into the luteal cells of the corpus luteum." The added secretion of these luteal cells, an increment of quantity, of quality, or of both, determines, as the experiments of Loeb have shown, the raised nutrition of the uterus, which leads to those decidual changes in the uterine mucosa which may ensure the engrafting of a fertilized ovum. When such an engrafting occurs this secretion maintains the nutrition and growth of the placenta till the latter reaches its maturity. The decadent and fibrotic changes which the placenta undergoes during the later months of pregnancy coincide with the regression and disappearance of these luteal cells. Thus the ovary, while maintaining a perpetual secretion, undergoes a series of cyclical changes which increase or modify this ordinary secretion; with these changes, the cyclical changes in the uterus are correlated, and upon them they finally depend.

The nature of this secretion is not known. The fluid obtained from the Graafian follicle of the cow is simply serous; while from the corpora lutea of the same animal certain luteins, amorphous and crystalline pigments, have been obtained. But these are not peculiar to the ovary. Ferments have been secured from the ovaries of toads and frogs, but these again are found in other tissues. No specific substance has as yet been isolated. The extreme difficulty in the matter is aggravated by the close chemical correlation which is now known to exist between the secretion of the ovary and that of the other ductless glands. It appears that the ovarian *succus* may depend for its activity upon a chemical interaction with the secretion of one or other of these related glands. A certain reciprocity obtains between them, partly at least hormonic. In addition, there exists a certain genetic relationship between the ovary and adrenals, through the medium of the Wolffian body; and a phylogenetic relationship between these two and the

thyroid, since the latter, Gaskell states, represents the uterus in some of the lower reptiles. Moreover, several, if not all, of these ductless glands arise in connection with the sympathetic system, the many ganglia of which contribute an internal secretion of their own. A large amount of experimental work, much of it baffling and contradictory, has been performed upon these ductless glands. Their interdependence has been proved, for it has been shown that the secretion of the one acts upon that of the others, and to remove one, permanently disturbs, or even oversets, the equilibrium of them all. The entire process is one of mutual control of metabolism, and especially the calcium metabolism, in the body.

The loss of the ovaries means, as we have seen, the loss of sex influence to the individual, with all the grave disturbance in general metabolism which this loss signifies. The earlier in life that it occurs, the greater is the calamity.

Ovarian transplantation seeks to replace the lost or disabled gland. In animals this procedure has been so successfully carried out that conception has followed it, even in heteroplastic transplantation. In the human, only one such case has been reported, that of Robert T. Morris of New York; though in homoplastic transplantation Morris and Frank both report cases. The great difficulty in the human female is to be sure, even in a double oöphorectomy, that all ovarian tissue has been removed. In a certain number of cases, islets of ovarian parenchyma are scattered throughout the posterior lamina of the broad ligament at varying distances from the main organs; a persistence of the type of diffuse ovary found in birds and reptiles. This accessory ovarian tissue will perform its function, will even ovulate, after removal of the main organs. Cases of pregnancy after double ovariotomy have been recorded by Gordon, Doran, Blair Bell, and others. One such case came under my own observation in a woman of about forty, upon whom such an operation had been performed by Dr. Lockhart of the Montreal General Hospital. In this case, both ovaries and tubes, having become involved in a severe gonorrhœal infection, had been removed sixteen months before. Menstruation did not recur for six months after the operation, and then only slightly and at irregular intervals. She conceived nevertheless, and in due time was delivered of a healthy child.

While supernumerary ovaries are extremely rare, I think it must always remain doubtful in any given case whether or not the operator has removed all the accessory ovarian tissue. The cessation of menstruation must not be considered an infallible test of this removal, since while enough ovarian tissue may not be left to furnish sufficient "hormone" to institute a complete menstruation cycle, this tissue may yet ovulate and provide a corpus luteum.

Again, in heteroplastic transplantation the incidence or subsidence of all subjective phenomena must be very carefully accepted. Very rarely can the "graft" be made immediately upon the removal of the diseased organs, a great difficulty is to secure the graft at all; and in the interval the patient's economy has become more or less depleted of ovarian secretion. In consequence, the metabolic balance has been greatly disturbed, and the power of suggestion acquires an exaggerated influence, at least for a time.

In all cases of hetero-transplantation the question of the individual specificity of tissue should, I think, be always borne in mind, as this must, of necessity, affect the degree of cell-lysis and degeneration in the graft. The effect of this specificity has been lately emphasized by Marshall in his experimental work on rats. His heteroplastic grafting always succeeded best in rats from the same litter. In this matter, the blood of the two individuals would afford a ready and reliable means of determining this specificity index, and such a blood examination should always be made.

The success of any grafting can only be definitely decided by a subsequent microscopical examination of the engrafted tissue. For only in this way can the graft be known to have definite cellular life, and the fallacy of the incomplete removal of the original ovarian tissue, or the known vagaries of the power of suggestion, be definitely excluded.

In homoplastic transplantation, the cases

must be few wherein an ovary, in whole or in part, is healthy enough to be removed and engrafted, and is not healthy enough to leave alone. In this connection it is wise to remember the value of the ovarian ligament, for as has been pointed out by Dauber, this frequently contains active parenchyma-tissue. It is also generally believed that the ovary possesses considerable capacity for regenerating tissue after its partial removal, and hence an additional reason for leaving the segment *in situ*.

The whole question of ovarian transplantation has been lately reviewed, with the addition of much independent research, in an admirable paper, published by Franklin H. Martin of Chicago.

Ovarian medication dates from the time of Brown Séquard and Madam Browne, for, though the ancients administered the fresh testicles of the fox, liver of the wolf, and the lungs of the deer, etc., to confer upon the recipient the characteristics of these animals, the ovaries apparently were never used; feminine characteristics were not especially affected by the ancients. It was in 1889 that Brown Séquard made his first communication on testicular extract, but as Adami has said, it was not till the demonstrations of George Murray, with extract of the thyroid gland in myxoedema that the internal secretions came into their own. In 1898 Bestion de Camboulas published his monograph "Le Suc Ovarien," which gives the best account of the subject that has as yet appeared. Included in this work are a large number of animal experiments. These results have never been contravened, and may be summarized as follows: "Troubles of the menopause, natural and artificial, were much ameliorated by ovarian extract. Rapid improvement was always seen in amenorrhœa and chlorosis. Mental troubles which accompany genital lesions are greatly lessened, and in such cases there is always marked improvement in the general condition. It must never be given to pregnant women as in pregnant animals even small doses may prove toxic."

This is practically the therapeutic view of to-day, though a greater elegancy has been achieved in the preparations themselves. Just as in the procural of the digestive ferments of pepsin and trypsin, the sow is the preferred animal. Cows are too prone to tuberculosis; heifers' ovaries are not sufficiently active, and ewes' ovaries are too small. The preparation of the dry gland with sugar and gum in the form of pills or tabloids is the article with which we are most familiar.

In selected cases this ovarian substance has a definite therapeutic value, though the results in different individuals are by no means uniform. I have seen no ill effects follow its use, and in some instances the results are almost miraculous. A single instance of a case seen some three months ago may be cited. This was a young woman of 27, from whom both ovaries had been, feloniously, removed for dysmenorrhœa two years before. The condition of this woman was pitiable, and the close correlation of the ovaries to the sympathetic system was amply borne out by her appearance. A state *of chronic surgical shock*, with pronounced mental instability, perhaps best describes it. The exhibition of two of Burrough and Wellcome's 5 gr. tabloids of "Varium" three times daily, re-created this woman within a month. In some cases I have found that the addition of arsenic or small doses of the thyroid extract gives more favorable results.

The natural and proper conservation of the ovary, however, consists in leaving it alone. As a Society I think we cannot too strongly fortify this position, and especially as concerns the woman in her second or third decade. Malignant disease of course, remains in a class by itself; as it affects the ovaries, it is as you know, very commonly bilateral. With us in the Royal Victoria Hospital, it has been four times more frequently found affecting both ovaries. It is fortunately, however, commonly a lesion of middle or old age, when the sacrifice of the ovarian tissue is not so disastrous.

In the innocent neoplasms and despite the views of the pathologists, a certain number of these are clinically and virtually innocent; there is usually the opposite ovary to be relied upon. On the rare occasions when both ovaries have been involved in such

innocent growths, it has been my practice in the case of young adults, to resect such a neoplasm, and to leave a certain area of its periphery behind, adjusting its secretive surface widely open to the peritoneal cavity. I have yet to see any harmful results follow such a procedure, whereas the larger number of these cases have so escaped a premature menopause.

The various infections, however, constitute the greater number of these cases of ovarian surgery. For though the ovary is well protected by its capsular membrane, from both gonorrhœal and tuberculous infection, it usually finally succumbs. Its position in the lymphatic path renders it on the other hand specially vulnerable to the pyogenic infections of the pelvis. With all such infective conditions, each case must of course be taken by itself; but in my opinion, the experience of the operator is in most instances the determining factor. The greater his experience, the more conservative does he become. Save in the few worst cases, sections, or segments, or cortical strips, from one or other ovary, may be safely left beind. For some time it has been my practice to reflect these sections or strips away from the infected area, and while leaving these attached at one extremity, to tack them backward or outward, upon a more healthy peritoneal area, a modified homoplastic transplantation. I mention here again the value of the ovarian ligament, for composed as it largely is of dense, resistant tissue, its parenchyma frequently escapes the infective process.

Fibro-cystic ovaries no longer exist, I believe, as a pathological entity, but only as an exaggerated condition, in certain individuals, of ovulation wear and tear. This condition is entirely within the limits of the normal, and to remove these ovaries is to commit a surgical blunder.

For dysmenorrhœa one should remove the ovaries — never. In any imaginable desperate case, a hysterectomy would be indicated.

Only in the rarest instances should the ovary be removed for ovarian pain, for the ovary itself is rarely at fault. Frequently is it a varicocele, or a gouty or rheumatic diathesis. Here as elsewhere, in the words of La Rochefoucauld, "Pain is the biggest liar in the world."

CONCERNING SO–CALLED ESSENTIAL HEMATURIA, WITH ESPECIAL REFERENCE TO THE HEMATURIA ACCOMPANYING MILD GRADES OF NEPHRITIS[1]

By BENJAMIN R. SCHENCK, M. D., Detroit, Michigan

HEMATURIA is frequently the cardinal symptom of disease of the urinary tract, and is sometimes the only complaint for which the patient seeks advice. Obviously, in such a case, the first step in the diagnosis is to ascertain from what part of the urinary tract the hæmorrhage comes. Thanks to the perfection which cystoscopy, ureteral catheterization, and urine segregation have attained, it is now a comparatively easy task to prove that a hematuria is, or is not, of renal origin.

Having demonstrated that the hæmorrhage is from the kidney, it is often also easy to diagnosticate the cause of the bleeding. The radiographers have become so skillful in the detection of calculi that many stones which a few years ago were not discovered by them are now readily found, while the newer tests for tuberculosis have made it possible to differentiate, with considerably certainty, cases of renal tuberculosis, when the bacilli cannot be demonstrated in the urine. The third group of cases which most frequently show hema-

[1] Inaugural Thesis presented before the American Gynecological Society, May, 1911.

turia, i. e., cases of neoplasm, presents greater difficulties, for unless a tumor can be palpated or pathognomonic cells discovered in the urine, the diagnosis must be made by exclusion. The provisional diagnosis of neoplasm was more frequently made in the earlier days of kidney surgery than at present, for, in former years, blood coming in any great amount from the kidney was believed to arise either from calculus, tuberculosis, or new growth. In the past decade and a half, however, cases in considerable number have been reported in which copious renal hæmorrhage has occurred, the kidney has been cut down upon, and no obvious cause for the bleeding has been discovered. Many of these cases have been reported as instances of "idiopathic" or "essential" hematuria.

It is the purpose of this paper to consider these more unusual causes of renal hæmorrhage and to again examine the evidence on which the existence of an idiopathic hematuria rests. In a former paper, published in 1904, entitled "Renal Hematuria of Unexplained Origin" (1), I gave the results of a search of the literature on this point and arrived at the conclusion that there were but two cases then on record from which we were justified in asserting that there is a true essential hematuria. I reiterated the view previously advocated by Israel (2) and Rovsing (3), my statement being as follows:

"In view of the fact that there are thus far on record but two cases which apparently prove that hæmorrhage may take place from a kidney which is not the seat of a pathological change, it would seem far better to put them aside as yet unexplained, than to admit into our classification a group such as has been mentioned."

Since my paper was published there have been a number of additional cases reported and several important studies on the subject have appeared, notably those of Kretschmer (4), Kapsammer (5), Bunts (6), and Robinson and Jacoulet (7).

History. The idea that hæmorrhage may come from a sound kidney is an old one. Rayer, in his Traite des maladies des rein, a most carefully written and beautifully illustrated work which appeared in 1837, devotes a whole chapter to the subject. He believed that such cases were probable but as yet unproven. In expressing this idea, he was but following the older writers who simply classified those cases whose etiology was unknown as "idiopathic." This view held until the advent of pathology and microscopic postmortem diagnosis, when disturbed function was somewhat lost sight of, and the attempt made to explain every symptom by reference to pathologic lesion. As a result of this trend of thought, idiopathic hematuria almost disappeared from the literature and renal bleeding was looked upon as always caused by some more or less gross lesion in the kidney, such as calculus, tuberculosis, or tumor.

During this period, however, there are occasionally references to the subject, the cases described being for the most part from the medical clinics. A typical one, reported by Socoloff (8), may be cited as an example.

> The patient was a man of 36 years who had periodic hematuria, with attacks of pain in the region of the left kidney. These came on after exposure to cold or when much fatigued. There was weakness of the muscles of the left side of the body and lessened temperature in the left hand. Socoloff explains the hæmorrhage as follows: By chilling of the surface of the body, the blood was driven to the organs. On account of the disturbance of the nervous system, the vessels in the left kidney were under lessened tonus and therefore dilated, the increased pressure then causing transudation through the vessel walls.

However, there was not much interest in the subject until kidney surgery developed, when various surgeons met with surprises while operating for stone, tuberculosis, or neoplasm. In certain instances, nothing was found. Thus Sebatier (9), 1889, described a case of nephralgie hematurique; Legueu (10), 1891, Broca (11), 1894, Pique and Reblaud (12), 1895, and Grosglik (13), 1898, cases of bleeding from unaltered kidneys; and Klemperer (14), a case of bleeding from a "healthy" kidney. These cases, with others which followed from 1890 to 1900, stimulated an interest in the subject, many authorities believing that a true idiopathic hematuria had been proven.

THEORIES ADVANCED TO EXPLAIN THESE CASES

Two theories have been given prominence in the discussion of these cases. Senator (15) advocated the idea that the bleeding is the result of a local hemophilia or a "hemophilia confined to one organ," and this theory is the one advanced to account for some of the instances of congenital, hereditary, and familial hematuria which have been reported. Remarkable cases of the latter are described by Atlee (16), while Guthrie (17) relates the histories of twelve hematuriacs in one family. The congenital tendency was inherited through the females, as in hemophilia. This theory of local hemophilia is, at most, an unsatisfactory one and at the present time has few, if any, advocates.

The explanation which is given by a majority of those who hold that there is a true essential hæmorrhage is similar to the one advanced by Socoloff (8), previously referred to. Klemperer (14), in his paper in 1897, emphasized the theory and his ideas have been much quoted. Klemperer held that there is a disturbance of the vasomotors in the kidney — a paralysis of the vasoconstrictors, causing a dilatation of the blood vessels and a resulting diapedesis of red blood corpuscles. He says: "We have no doubt of the existence of angioneurotic edema; why should we doubt an angioneurotic disturbance in the kidney as well as in the skin?"

PRESENT ATTITUDE ON THE SUBJECT

During the past five years there have been fewer cases of idiopathic hematuria reported. This is due to the fact that there is a more general acceptance of the ideas of Israel and Rovsing, expressed in my former paper, i. e., that there is always some cause for the bleeding, even though it be an undiscovered one. In consequence of the adoption of this view, cases have been more carefully studied and more attention paid to the more minute renal lesions. We must now, therefore, revise the list of the possible causes of renal hematuria and include quite a long list of etiologic factors.

The three most frequent causes of the condition are, of course, calculus, tuberculosis, and new growth. Interesting cases of profuse hæmorrhage caused by minute foci of tuberculosis have been reported by Albarran (18), Kapsammer (19), and Davidsohn (20). Albarran especially draws attention to "what seems to be of particularly important significance, the fact that in certain conditions of the kidneys the least lesion of nephritis is capable of determining the vascular or angioneurotic modification capable of leading to bleeding." In Davidsohn's case, sections from twenty different portions of the kidney were made before the lesion was discovered.

The fourth most frequent cause is one or another form of inflammation. This etiologic factor seems to have first been emphasized by de Keersmaecher (21), in 1897. It has since received much attention. The subject is carefully reviewed by Fowler (22), in a paper entitled "Nephritis and Hematuria."

In general it may be said that nephritis causing hæmorrhage may be diffuse (unilateral or bilateral) or circumscribed (unilateral or bilateral). It is especially the group of cases in which the inflammatory changes are circumscribed and probably unilateral, which have been described as idiopathic hematuria. Kretschmer (4) has collected (1907) 129 cases of so-called essential hematuria. Of these, 61 were subjected to a microscopic examination, and of these 61 cases, 52 showed some form of nephritis. Alterations principally in the glomerulus were described by Pousson (23), Hofbauer (24), and Kretschmer (4); changes in the epithelium of the tubules were noted by Devaux (25); interstitial lesions in the pyramids were found by Albrecht (26) and Lowenhardt (27); hyaline degeneration of the blood-vessels was reported by Israel (2) and Laurent (28).

The following cases from my own experience are excellent examples of profuse hæmorrhage caused by inflammatory changes.

CASE 1. Miss K., aged 28, was referred to me for catheterization of the ureters, October 17, 1906, by Dr. J. P. Kennedy of Wingham, Ontario.

The patient first consulted Dr. Kennedy on September 18, 1906, when she stated that three days previously she had noticed that the urine was of a bright red color. She had experienced no pain or frequency in urinating, felt well in every way and looked the picture of health. The family history

was negative except for tuberculosis in two uncles. The past history was unimportant and there was no suggestion of a tendency to bleed from accidental cuts. The pulse was 70 and the temperature normal. Dr. Kennedy was suspicious of malingering and had the urine passed in the presence of an office attendant. During the next month the urine was always bright red and at times contained small clots. In about three weeks there developed a slight dragging or aching sensation along the course of the left ureter, but at no time was there severe pain.

On October 17th I made a cystoscopic examination and found a bladder of normal capacity with mucous membrane blood stained but normal. The ureteral orifices were plainly visible; clear urine was seen coming from the right and very bloody urine from the left orifice. Catheters were introduced and urine collected from the two kidneys. Culture was made on slant agar from the bladder urine and from that from the left kidney.

Urine examinations. Mixed urine, bright red; heavy red precipitate. Sp. gr. 1026; acid; albumen present; no sugar. Microscopic examination shows large numbers of red blood cells; no pus; no casts.

Right kidney, amber; sp. gr. 1024; acid; no albumen; no sugar; microscopically, negative. Left kidney, bright red; sp. gr. 1026; acid; albumen present; no sugar; microscopically, red blood cells in abundance. Cultures proved sterile.

The patient was well nourished; the lips and mucous membranes were slightly pale. The lungs were carefully examined and found apparently normal. Heart negative. Abdomen symmetrical; negative on percussion and palpation. Neither kidney palpable and no tenderness made out over kidney or ureteral regions. The radiograph revealed no stone.

Operation. Dr. Kennedy, at the Wingham Hospital. The kidney was brought out on the loin and examined. It appeared congested but otherwise normal. Nephrectomy was done and a speedy recovery followed.

Pathological report. The kidney shows an unusual amount of fat in the pelvis. There is a general obscuring of the normal markings of the kidney, especially of the pyramids. Size normal. Capsule strips easily. The glomeruli show a shrinkage of the capillary tuft and an attenuated Bowman's capsule, within which are masses of débris. No interstitial change is observed. The specimen warrants the diagnosis of glomerular nephritis. (P. M. Hickey, Pathologist.)

This patient is well to-day and within a year an examination of the urine showed no evidence of disease of the remaining kidney. Was the nephritis confined to the excised kidney? Cases of unilateral nephritis have been described by Edebohls (29), de Keersmaecher (21), Senator (30), and others, yet most of the cases will not stand careful analysis. Rovsing (3) would attempt to explain such cases as caused by an ascending infection from the bladder, but in most of them there have been no signs of cystitis and in this case cultures from the bladder urine and from that of the excised kidney were sterile. The fact that the urine a year after the operation was negative is no proof that the remaining kidney is normal, for we know that nephritis can exist without casts and without albumen [Israel, Kapsammer, Schüller (31)], appearing in the urine. Further, we know from the cases of Albarran (18), Laurent (28), Martens (32), that the hematuria may be unilateral in cases where the nephritis has been proven bilateral. It is, therefore, by no means certain, because the hæmorrhage ceased after the operation in this case, or because the urine is now normal, that the case is one of unilateral glomerulitis.

CASE 2. Mrs. W. J. W., aged 37 years, was referred to me on March 28, 1907, by Dr. C. B. Langford, Blenheim, Ontario.

Mrs. W. complained of frequent urination, blood in the urine, and attacks of pain in the left side beneath the ribs. Her family and past history were unimportant, as was also her menstrual history. She was the mother of five children, the youngest of whom was eleven months old. Patient has been nursing the baby until the present time and has had no menstrual period since confinement.

The onset of the present train of symptoms was insidious, occurring as far as the patient remembers, about ten months ago, when the baby was one month old. Frequency of urination was the first symptom noticed, followed very shortly by painful micturition and the appearance, at times, of small quantities of blood in the urine. At first there were no other symptoms, but about five months ago attacks of sharp pain began in the kidney region on the left side; patient, however, gives no very clear description of these attacks; says that they gradually became less severe and have not been present during the past month. With the onset of the pain, the blood in the urine became more marked and has been present at all times, sometimes in greater quantities, but at no time absent. There have been no headaches, no dizziness, dimness of vision, shortness of breath, or swelling of ankles. The appetite has been fair, digestion good, and bowels fairly regular.

Examination. March 28, 1907. The patient is a tall, large framed woman, rather poorly nourished. The color of the lips and mucous membranes is good. The lungs are clear and the heart normal; no accentuation of the aortic second sound. Pulse 76, regular in force and rhythm, of good quality; no sclerosis of the superficial arteries. The abdomen

is scaphoid; symmetrical; walls thin and lax; linæ atrophicæ well marked. The right kidney is readily palpable on deep expiration. Left kidney cannot be felt but on deep bimanual palpation, there is complaint of some tenderness. Deep pressure over the course of the ureters reveals nothing. The vaginal outlet is moderately relaxed, uterus in good position, normal in size, freely movable, and non-sensitive. Ovaries apparently normal. Some tenderness complained of on bimanual palpation of the bladder. Vesical ends of the ureters not thickened and non-sensitive. Hemoglobin, 85 per cent.

March 28th. Cystoscopic examination. Cocaine anæsthesia. Number 9½ Kelly cystoscope readily introduced. Urethra normal. Bladder expands well and is of normal capacity. Entire surface of mucous membrane blood stained, with small adherent clots over the base. Right orifice readily found and clear urine seen to flow from it. Bloody urine seen coming from the region of the left orifice but exact position of opening cannot be made out, and no attempt to catheterize the ureter was made. Mixed urine, catheterized specimen. Sp. gr. 1020; acid; albumen present; no sugar. Microscopically, many red blood cells, an occasional pus cell. No casts.

March 30th. Mixed 24 hours specimen. Amount 600 cc.; dark red; small blood clots; acid; sp. gr. 1018; albumen present; urea .016. Microscopically, red blood cells; an occasional pus cell. No casts.

Cystoscopic examination. Condition of bladder as previously noted, except that the small blood clots are more numerous. Attempt to find the left ureteral orifice fails. Bladder then washed out with a one per cent acetic acid solution. This solution cleared away the blood clots and left the mucous membrane of the bladder normal in appearance, except for a very moderate injection of the vessels in the trigonum. Both orifices distinctly seen; left is located behind a slight ridge which had evidently obscured it in previous examination. Catheter readily passed. Right side not catheterized.

Flow did not start from ureteral catheter until 5 cc. of boric solution were injected. Then there began a flow of bloody urine. Ten cubic centimeters were collected. The urine which collected in the bladder during the interval contained a few red blood cells but was otherwise normal.

The probable diagnosis of calculus was made. The patient returned to her home and was to have visited Detroit again for a radiographic examination. This she did not do but I considered the diagnosis sufficiently accurate to permit of exploratory operation, without the radiograph.

Operation, April 22, 1907, at the General Hospital, Chatham, Ontario, assisted by Dr. C. B. Langford. The kidney was exposed through the superior lumbar triangle and was readily brought out upon the flank. It appeared perfectly natural and was normal on palpation. Nothing palpable in the renal pelvis. The kidney was split along the line advocated by Broedel, and laid open from pole to pole. The cortex appeared normal, as did the walls of the pelvis, except for slight blood stains. A catheter was introduced into the ureter and passed without difficulty into the bladder. A piece of the cortex, several centimeters in size, was removed for microscopic examination, and the two halves of the kidney brought together with mattress sutures of catgut. Wound was closed with drainage.

The convalescence was satisfactory. The blood disappeared from the urine by the tenth day. On June 16th, the sinus which remained after the drainage was still open. A specimen of urine showed specific gravity of 1022; very faint trace of albumen; a few pus and bladder epithelial cells; no red blood corpuscles. The microscopic examination of the piece removed from the kidney showed a marked interstitial nephritis.

An interesting point in connection with the diagnosis of this case was the washing of the bladder with dilute acetic acid. It greatly simplified the finding of the ureteral orifices.

As we have seen, a large proportion of the cases in this group of "essential" hematurias have been found, on careful study, to show evidences which are usually interpreted to mean inflammatory changes. Schwyzer (33), reporting the microscopic findings in two interesting cases, describes a desquamation of the epithelium of the glomeruli and convoluted tubules. There was no leucocytic infiltration or turbid swelling of the parenchyma and Schwyzer believes that the changes are not truly inflammatory.

Other lesions have been described as the cause of the hæmorrhage. Fenwick (35) and Cabot (36) report cases showing a varix of a papilla; thickening and circulatory disturbances of the capsule are noted by Rovsing (3) and Schwyzer (33); a concretion on the tip of a papilla is described by Abbe (37); motility of the kidney, with torsion on the pedicle causing congestion was the cause assigned in the case of Pique and Reblaud (12) and in Rovsing's second case. Mechanical disturbance from without, as from tight lacing, reported as the cause in Rovsing's first case, hardly comes within our discussion.

If all these cases be eliminated, there remain thirteen cases in the literature which are unexplained. It is on these thirteen cases that the burden of the proof of the existence of a true essential hematuria must rest.

In four of these thirteen cases, nephrotomy alone was done and during the examination a piece of kidney parenchyma was removed and examined histologically. These are the cases of Illyes (34), Israel (2), Rovsing (3) and Schenck (1).

CASE 3. This is reported in full in my paper previously mentioned. Mrs. C., aged 46 years, consulted me September 23, 1902, complaining of having passed blood in the urine almost continuously for five months. There was slight aching in the region of the left kidney, but no other symptoms. I catheterized the ureters and found the urine from the left kidney very bloody; that from the right was clear. Cultures from both sides were negative. There was no reaction to tuberculin. Dr. Kelly did a nephrotomy, found nothing, and after excising a piece of tissue closed the kidney and the wound. The patient was free from hæmorrhage when last heard from, three years after the operation. The excised portion of the kidney was examined by competent pathologists who found nothing abnormal.

The histories of the cases of Illyes, Israel, and Rovsing are somewhat similar. The examinations of excised pieces of kidney were likewise negative. These four cases, however, offer no absolute proof that the kidneys were normal in toto. It is very easy to conceive of marked lesions in some portion of the kidney other than that from which the tissue was taken.

There are eight cases in which the kidney was removed, carefully examined and nothing found, namely, those of Spencer (38), Schede (39), Klemperer (14), Nonne (40), Young (41) Steinthal (42), Wulff (43), and Reifferscheid (44). It is to be regretted that some of these cases are too meagerly reported to be of any great value. In none were serial sections of the whole kidney cut and examined, and in none was it absolutely certain that the bleeding did not come from some lesion of the ureter.

Until some competent observer reports a case in which there is no doubt but that the hæmorrhage was from the kidney and that the kidney was normal in every part, as demonstrated by serial sections, we are justified in believing that idiopathic or essential hematuria does not exist.

REFERENCES

1. SCHENCK. Medical News, December 24, 1904.
2. ISRAEL. Klinik der Nierenkrankheiten, Berlin, 1901.
3. ROVSING. British Medical Journal, 1898, ii, p. 1547.
4. KRETSCHMER. Zeit. für Urologie, bd. i, hft. 6.
5. KAPSAMMER. Nieren Diagnostik, Wien., 1907.
6. BUNTS. Cleveland Medical Journal, June, 1908.
7. ROBINSON AND JACOULET. Revue de Chirurgie, No. 4, April, 1910.
8. SOCOLOFF. Berlin klin. Woch., 1874, ii, S. 233.
9. SEBATIER. Revue de Chir., 1888, p. 62.
10. LEGUEU. Ann. des mal. des org. gen-urinar, 1891, p. 564.
11. BROCA. Gazette hebdomadaire, 1894, No. 50.
12. PIQUE AND REBLAUD. Quoted from Kapsammer.
13. GROSGLIK. Annals of Surgery, 1899, xxix, p. 382. Review.
14. KLEMPERER. Deut. med. Woch., 1897, No. 9 and No. 10.
15. SENATOR. Berlin klin. Woch., 1891, No. 1.
16. ATLEE. St. Bartholomew Hospital Journal, December, 1901.
17. GUTHRIE. Lancet, 1902, i, p. 1243.
18. ALBARRAN. Assoc. Francais d'Urologie, 1900, p. 104, Bunts.
19. KAPPAMMER. Loc. cit., Case 29.
20. DAVIDSOHN. Quoted from Kapsammer.
21. DE KEERSMAECKER. Ann. des Mal. d. org. genurinar, February, 1897.
22. FOWLER. Johns Hopks. Hospital Reports, xiii, p. 487.
23. POUSSON. Assoc. Francias d'Urologie, 1900, p. 100.
24. HOFBAUER. Mitt. aus dem Gren. der Med. u. Chir., bd. v., S. 423.
25. DEVAUX. Zeit. fur Gyn. Urologie, bd. i, 1908, S. 101.
26. ALBRECHT. Quoted from Kapsammer.
27. LOWENHARDT. Ibid.
28. LAURENT. Deut. med. Woch., 1901, No. 13, S. 193.
29. EDEBOHLS. Surgical Treatment of Bright's Disease, N. Y., 1904.
30. SENATOR. Quoted from Kapsammer.
31. SCHÜLLER. Wien. klin. Woch., 1904, xvi, S. 477.
32. MARTENS. Quoted from Kapsammer.
33. SCHWYZER. Annals of Surgery, May, 1909.
34. ILLYES. Deut. med. Woch., 1906, No. 10, S. 384.
35. FENWICK. British Medical Journal, 1900, i, p. 248.
36. CABOT. Am. Jour. Med. Sciences, January, 1909.
37. ABBE. New York Medical Journal, 1891, p. 573.
38. SPENCER. Trans. London Clinical Society, 1904.
39. SCHEDE. Jahr. des Hamburger Krankenhaus, 1889.
40. NONNE. Deut. med. Woch., 1902, S. 101.
41. YOUNG. Jour. A. M. A., May, 1907.
42. STEINTHAL. Beitr. zur klin. Chir., bd. liii, hft 3, 1907.
43. WULFF. Munch. med. Woch., 1903, No. 29.
44. REIFFERSCHIED. Zeit. f. Gyn. Urologie, bd. i, S. 344.

USE OF ELECTRIC LIGHTS FOR WARMING THE OPERATING TABLE [1]

By HUNTER ROBB, M. D., Cleveland, Ohio
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FREQUENTLY during the spring, autumn and winter months the operating room in general, or more especially the operating table, is too cold for the welfare of the patient when a prolonged or even a short operation is to be carried out. Nor is it difficult to imagine that a patient will at times show immediate or subsequent evidence of undue exposure to cold. It is true that she may wear a so-called pneumonia jacket (which by the way very frequently is improperly made and gives about as much protection as a good-sized pocket handkerchief), but when placed on a cold table in a room with the temperature frequently in the neighborhood of between 60° and 70° F. the patient always runs a certain amount of risk despite the use of coverings and hot water bags. Those of us whose attention is more immediately taken up with the carrying out of the operation are liable to fail to appreciate to what degree the exposure may be affecting the patient, as we are on the move most of the time, and are thus to a certain extent able to keep up our bodily heat. Then again she is still further exposed during the necessary cleansing of the field of operation. Finally, we should take into consideration the loss of heat produced by the inhalation of the ether, it having been shown that this loss to the patient amounts to 21,000 calories of heat for every ounce of ether inhaled.

I have felt for a long time that some practical method should be devised for the prevention of this chilling of the patient, inasmuch as in certain cases this exposure contributes in no small measure to the untoward results that sometimes follow an operation, viz.: the development of a bronchitis, a pneumonia, a pleurisy, a nephritis or a peritonitis, with or without an exaggerated condition of shock. Nor would it be a small matter if we could secure the avoidance of the various minor discomforts, such as a stiffness of the back and neck, and the muscular pains throughout the body that are sometimes complained of.

The usual devices that are employed for keeping the patient warm during the operation are rubber bags, or flat rubber pads, which are placed under or between the thighs, or along the trunk. In 1886 I remember seeing Dr. Kelly using long narrow rubber bags filled with hot water for this purpose. The main objection to the employment of such devices lies in the fact that they are difficult to look after properly, and if the bags or pads are too hot, the patient may be burned. Moreover, they may shift their position and in any case within a short time the water becomes too cool, and the refilling of the bags is difficult, and interrupts the operation. Another objection to the use of the flat pad is that the patient does not remain in a fixed position on the table.

In an endeavor to meet most of the requirements that are necessary we have been experimenting with the use of electric lamps suspended from the under surface of the operating table. After having used this method for more than eighteen months we feel that it will finally prove to be thoroughly satisfactory.

The lamps are held in an upright position by attachments to two hollow movable metal tubes, which extend from the upper end for a distance of three feet nine inches towards the foot of the operating table (Figs. 1 and 2). Nine lamps of thirty-two candle power are attached to each tube. At the upper end in each tube there is a switch, so arranged that two lamps can be turned on at a time, thus making it possible to control the amount of heat used. The cords containing the electric wires are brought through the floor in the middle of the room, and are of sufficient length to allow the operating table to be moved backward or forward in the room. The supports holding the lamps can be removed from the table and the attachment can be so arranged that it can be used

[1] Read by title before the American Gynecological Society, Atlantic City, New Jersey, May 23, 24, 25, 1911.

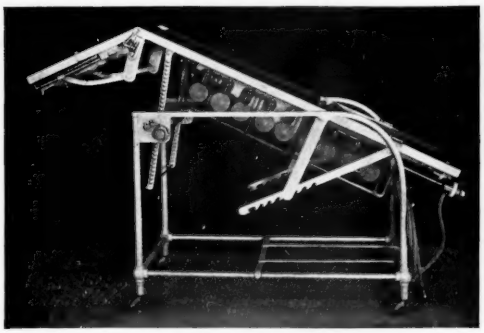

Fig. 1. Showing lamps, with table in Trendelenburg position.

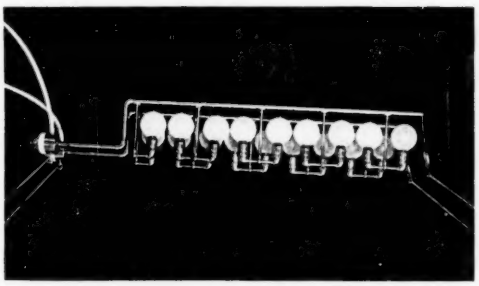

Fig. 2. Showing lamps detached from operating table.

wherever there are electric light fixtures. The patient can be cleaned up or the abdominal cavity irrigated without injury to the lamps. The temperature under the table can be raised 45° F., and on the upper surface of the table protected with a thick towel 17.1° F. in twenty minutes, thus rendering the air warm in the immediate vicinity of the patient. The glass plates on the operating table are covered in the middle portion with two coarse towels folded lengthwise, and the upper and lower portions of the table are covered with a piece of muslin folded double; or the pads usually employed may be applied to the table. For about twenty minutes or half an hour before the patient is placed on the table the lamps are turned on. When the patient is placed upon the table the field of operation is cleansed, and dry pads are placed under her. As soon as the operation is begun the lamps are turned out, but on a very cold day, or when the patient is in a very weakened condition the lamps are kept lighted throughout the operation. If the lamps are turned off at the beginning of the operation they are again turned on for a few minutes while the concluding steps of the operation are being carried out. When this procedure is employed the patient begins to react from the shock of the operation before she is removed from the operating room, and her resistance is probably materially increased in this way. Since we have been using this method we have not met with a single case of bronchitis following an operation.

PRELIMINARY ANALYSIS OF THE TEMPERATURE RESULTS OBTAINED AFTER OPERATIONS WITH AND WITHOUT WARMING THE TABLE WITH ELECTRIC LIGHTS

We have made a study of the temperature before and after operation in 138 cases, divided as follows:

Plastic operations	40
Abdominal sections with plastic operations	62
Abdominal sections alone	36

The most striking results that we have been able to demonstrate in this particular series of cases are as follows:

When the temperature of the operating room is under 83° F. there is always a more marked fall in the patient's temperature. For example, without the use of the lamps, in thirty-eight abdominal sections with plastic operations there was a total fall of 25.8° F. With the use of the lamps in thirty-eight sections with plastic operations with the room temperature at 79° F. there was a total fall of 10.6° F., less than half the fall that occurred when the lamps were not used, although the room temperature was 4° F. lower than in the series without the use of the lamps.

Similarly in the abdominal sections alone the fall was twice as much without the use of the lamps, although the room temperature was from three to four degrees higher than when the lamps were employed.

Thus it would seem from observations made up to the present time, that there is a distinct lowering of the patient's temperature where the lamps are not employed to keep the table warm.

DEPARTMENT OF TECHNIQUE

A MALIGNANT INTESTINAL GROWTH REQUIRING THE REMOVAL OF AN UNUSUAL NUMBER OF ABDOMINAL STRUCTURES

By THOMAS S. CULLEN, M. B., Baltimore, Maryland

MY object in reporting this case to the society is to show what may be done in some cases in which the surgeon on opening the abdomen feels completely baffled, but in which on carefully surveying the field he finally detects the key to the situation, and can remove the growth that at first has seemed impossible of enucleation.

In this case my first impulse was to close the abdomen, but the family physician, Dr. Ira McCurdy, of Frederick, insisted that the patient had been suffering from excruciating abdominal pain, that there were already signs of partial obstruction and that judging from her condition for the last month he felt sure she could not last over a few days without operation. Under these circumstances I made a further examination of the combined tumor and found that the key to the situation consisted in first enucleating the uterus with the adnexa and turning them up on the tumor. The operation then became essentially an abdominal instead of an abdomino-pelvic one.

The results certainly more than repaid us for the chances taken. The patient after a short time was completely relieved of her former pain and in a few weeks was able to go about as usual. She had over a year of relatively good health before any further signs of the growth made themselves perceptible.

Mrs. M., aged fifty-six years, was seen in consultation with Dr. McCurdy, December 20, 1909. She was exceedingly thin, pale and emaciated. Before her illness, which dated back several months, she had weighed 120; at the time I saw her she weighed 85 pounds.

On pelvic examination I found what appeared to be a myomatous uterus which was firmly plastered to the left side of the pelvis and which almost completely filled it. As the patient gave a history of having flattened stools occasionally associated with diarrhœa we bore in mind the possibility of a malignant intestinal growth.

Operation. The patient was removed to the Johns Hopkins Hospital where she was operated upon on December 28, 1909. On opening the abdomen we immediately found what appeared to be a mesenteric growth. Plastered over the surface were loops of small intestine and a considerable area of large bowel. The fundus of the uterus was firmly adherent to the tumor, and the appendix was also involved in the growth. Realizing the weak condition of the patient and the extensive operation necessary to even attempt complete removal of the growth I hesitated, but on being told by Dr. McCurdy that the patient could not live over a few days in her present condition I accepted the responsibility and commenced the operation. After determining definitely that no secondary growths were visible and finding that the original tumor was somewhat movable and that it did not implicate the larger abdominal vessels, we began its removal. The key to the situation consisted in first freeing the uterus. I therefore did a supravaginal hysterectomy, taking away the uterus, tubes, and ovaries. No attempt was made, however, to separate the pelvic structures from the intestinal growth, but they were turned up on the surface of the tumor and the empty pelvis was then packed with gauze. The appendix was found intimately attached to the tumor mass. It was likewise cut off, covered with gauze to prevent infection and turned up on the surface of the tumor; the stump was then closed. We next encountered an adherent loop of small bowel near the cecum; to this a clamp was applied. The other end of the same loop, about eighteen inches distant, was also clamped and the intervening bowel cut loose. The descending colon over an extent of several inches was intimately blended with the tumor. This area was freed. Finally we were able after using many catgut sutures to tie off the mesentery which fastened the tumor to the vertebral column. The entire mass, consisting of the tumor, the descending colon, a large area of small bowel, with several inches of large bowel, the uterus,

tubes, ovaries and appendix, was then removed in one piece. On carefully examining the small intestine we found that the blood supply for at least a foot and a half had been injured; we, therefore, removed this area of bowel.

The two ends of small bowel were closed and a lateral anastomosis was made between the small bowel and the cecum, which was only an inch removed from the distal end of the small bowel. On the left side, where a considerable area of descending colon had been removed, the tissues were fortunately redundant. Here also we closed both ends and did a lateral anastomosis between the descending colon and the sigmoid. A drain was laid in the lower angle of the abdominal incision and another in the vagina.

The patient on her return to the ward showed a moderate degree of shock. After a week or two she had slight diarrhœa but otherwise manifested no untoward symptoms. At the end of five weeks she returned home in relatively good condition.

December 1, 1910. The patient is in excellent health and is going everywhere. She has a good appetite and digestion.

June 17, 1911. The patient is rapidly losing weight, has a great deal of abdominal pain, and from the present indications will not survive over a month or six weeks.

Fig. 1. *Removal of a carcinoma of the sigmoid, several feet of small bowel, the uterus, tubes, ovaries, and appendix, in one mass.*

The entire circumference of the sigmoid is involved by a carcinomatous growth. The advancing margin of the growth is sharply defined, and from the lower edge a long tongue-like polyp is growing. The cancer has eaten through the sigmoid and grafted itself upon the small bowel and at one point has perforated the small bowel (as indicated by the bristle). Here there is a fistulous opening between the sigmoid and the lumen of the ileum.

Where the necrotic cancerous mass tended to break through into the general peritoneal cavity the uterus has adhered to it, thus eliminating the danger of peritonitis from this source. The normal tubes and ovaries are attached to the uterus. The appendix is involved in the process. It lies on the under surface of this mass. For the tumor on section see Fig. 2.

DESCRIPTION OF THE TISSUES REMOVED

Path. No. 14,543. Examination of the hardened specimen: The specimen (Fig. 1) is made up of 15 cm. of the descending colon containing a malignant growth, of between two and three feet of small bowel, of the uterus with its appendages, and the appendix, all in one mass.

The descending colon is occupied by a new growth 8 cm. in length. This involves the entire circumference of the bowel, the walls varying from 5 mm. to 1 cm. or

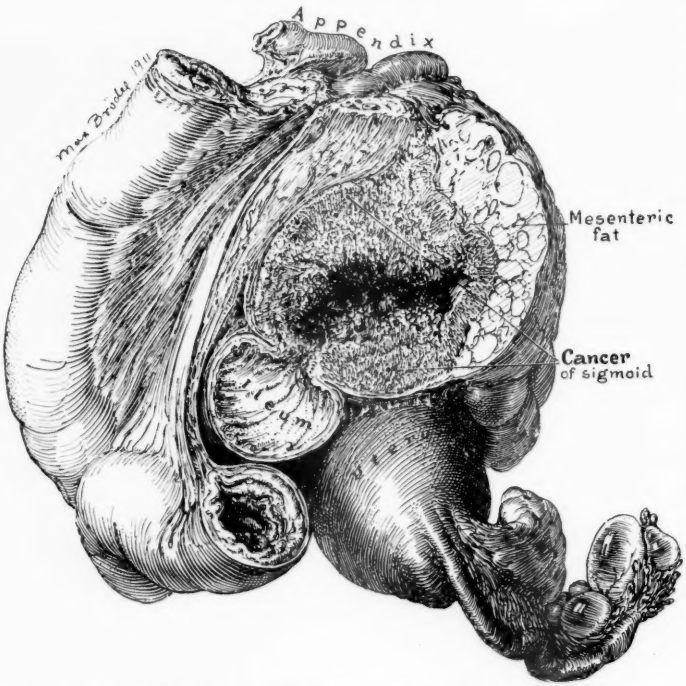

Fig. 2. *Carcinoma of the sigmoid breaking through into the ileum.*

This figure represents a transverse section through Fig. 1. The carcinoma occupies the entire circumference of the sigmoid at this level and has formed a fistulous opening into the ileum. The uterus has become intimately blended with the growth, reinforcing it at the point where it tended to rupture into the general peritoneal cavity. The adherent appendix is seen in the upper part of the specimen.

more in thickness. The bowel, where thickened, is in places smooth, but at other points presents an eaten-out appearance. The advancing margin of the growth is sharply defined and raised about 1 or 2 mm. from the surface. On the inner or median aspect of the growth there is a perforation. The growth has extended directly through and has communicated with a loop of small bowel. It has likewise encroached on the mesentery of the small bowel, forming a tumor, globular in shape and about 7 cm. in diameter. This has extended to the peritoneal surface of the mesentery, but does not appear to have broken through the surface. At one point, however, it forms a subperitoneal nodule 1 cm. in diameter. At the point where the fistula has extended from the colon into the small bowel, the walls have evidently become exceedingly thin, and the right cornu of the uterus has become plastered on to the mesentery at that point (Fig. 2), evidently acting as a cork and preventing the broken-down area from bursting into the peritoneal cavity. The cornu of the uterus is firmly attached to the mesentery over an area 5 cm. in diameter.

The uterus itself is a little enlarged. The tubes and ovaries are normal.

The middle portion of the appendix is glued to the mesentery. The tip of the appendix is free, but the surface is in places covered with adhesions.

Histological examination. Sections from the growth in the descending colon show that it is an adenocarcinoma, the glandular type being very evident. The glands themselves, which as a rule are large, are lined with several layers of epithelium, and many of the glands contain secondary ones developing within them. The superficial portions of the growth have undergone necrosis. There is fragmentation of nuclei and coagulation necrosis. The uterus is the seat of a commencing adenomyoma.

In this case we have primarily a malignant growth of the descending colon. This has involved by continuity a loop of small bowel and opened into it. It has also formed a large tumor which has encroached on the mesentery of the small bowel. The fundus of the uterus has glued itself on to this malignant growth where the walls tended to give way.

GETTING UP EARLY AFTER GRAVE SURGICAL OPERATIONS

By HOWARD A. KELLY, M. D., Baltimore, Maryland

We took a great step forward in the postoperative management of graver surgical affections, especially in abdominal cases, when Hermann Boldt astonished us by demonstrating that it was not only safe but advisable as a rule to get a patient out of bed one or two days after even a serious operation instead of keeping her on her back for a couple of weeks as the uniform practice had been. (See South. Surg. and Gyn. Tr., 1907, xix, 122; also Tr. Amer. Gyn. Soc., 1907, xxxii, 180; also N. Y. Med. Jour., 1907, January 26.)

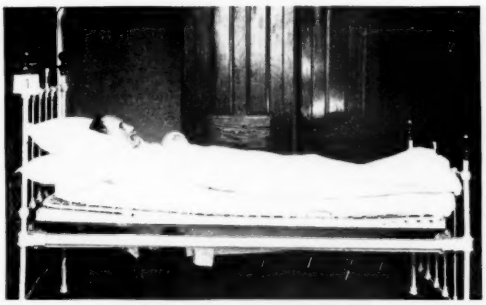

Fig. 1. The Gatch frame is seen lying upon the ordinary spring mattress, the patient lying extended.

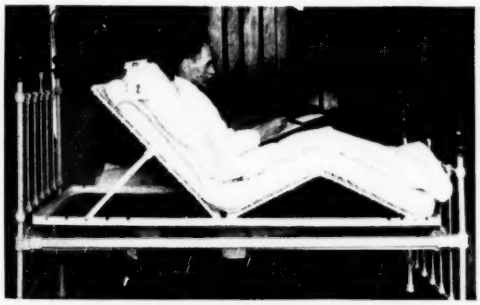

Fig. 2. The Gatch frame elevated in both head and foot parts, giving the patient an easy reclining position The elevation of the frame is effected by a notch on each side catching hold of the iron guard which serves also to keep the mattress in place and pulling the head or the foot of the frame up until the cross-bar catches in the proper notch. The cards on the mattress near the head are used to indicate the days after operation, numbering 7 to 30. In this case, the patient is in his seventh day, as shown in Figure 1. The card has been turned to indicate the second day, to call attention to the fact that it is my custom to get the patient up in this way either immediately or within 24 hours after the operation.

To make this radical step a safe one as far as the wound was concerned, Boldt enveloped the abdomen in a protective cuirass of broad, overlapping strips of adhesive plaster which supported the abdominal wall and obviated all risks of undue strain and separation. His claim was that the patient's circulation was better and that the stimulus prevented the later protracted period of weakness so often observed in these cases treated by the traditional period of rest.

Boldt's example was soon followed notably by E. Ries and by others too numerous to mention. I have tried this plan myself often enough to see its distinct advantages and even though not fully following out the radical prescription of its author, I have in common with surgeons throughout the length and breadth of the land greatly shortened the stay of the patients in the hospital, thereby greatly increasing the efficiency of these institutions. I have, however, not been able to overcome all the difficulties of the situation, and in the case of delicate women in private practice I have found it often too upsetting to the suffering and wretched patient to insist on her getting out of bed under a week's time.

Not willing, however, to lose such great and manifest advantages, I have recently adopted a different plan which meets, I think, every requirement of the situation for all patients and obviates all objections, and this I have accomplished by using a Gatch bed.

Dr. Willis D. Gatch, seeing the awkwardness and difficulty with which we often only half succeeded in bolstering up our patients in a sitting-up posture for abdominal drainage in cases of peritonitis as advised by Fowler, invented a simple and most useful frame to be set on the top of the bed, which can be elevated so as to retain the patient in any position desired between sitting almost straight up and lying flat down. (Ann. of Surg., March, 1909.) Fig. 1.

I have not had any peritonitis cases to treat, but I have secured a number of frames and used them for the convalescence of nearly all my routine abdominal and breast cases. I believe by their use I have secured all the advantages of getting the patient out of bed early, without the awkwardness, the exertion and the disturbance of getting out and in. The convalescence thus takes place in a more or less upright position, as shown in Fig. 2. If the patient gets tired of the posture after an hour or two, the frame is readily let down nearly flat, when after a little rest it is raised again. In this way, the circulation is improved, the abdominal walls are kept relaxed and the patient makes a prompter, better and, I believe, a safer recovery.

I believe that the general use of these bed frames will enable us to extend to a larger number of patients than we have found possible in the past the advantages claimed by Boldt for his more radical procedure. At any rate it is a happy compromise for the timid surgeon who does not want to drag a miserable, depressed, suffering patient out onto the floor so soon after an aggressive operation.

TRANSPLANTATION OF THE LEFT KNEE JOINT[1]

Report of a Case

By GEORGE TULLY VAUGHAN, M. D., Washington, D. C.

THE importance of transferring function from one individual or from one organ to another has long been recognized, and doubtless also the transplantation or restoration, after separation, of small organs or parts of organs. Skin grafting or the transplantation of skin and the Indian operation for restoration of the nose have been known for centuries and several reports have been made of completely severed ears, toes, and fingers uniting after restoration to their proper places. Gradually it dawned upon the medical mind that bones, muscles, nerves, blood-vessels, joints and internal organs might be successfully transplanted under favorable conditions and functionate more or less permanently. In recent years the work of Carrel, Guthrie, Jaboulay, and Lexer have shown the success of many operations along this line almost beyond the power of belief.

It was especially the work of Lexer in transplanting joints in part or in whole which encouraged me to make the attempt on one of my patients who presented conditions somewhat suitable for such work.

In 1908 Lexer reported three cases of knee joint transplantation, two in which the entire joint except the patella was transplanted, and one in which only the tibial half of the joint was transplanted. In all three union followed and fairly good function — the patients being able to walk with some power of flexion and extension. I had also seen cases in which pieces of skull completely detached had been successfully replaced so that I was ready to believe in the success of Lexer's cases, when a chance was afforded for giving the operation a trial.

G. A. K., white male, aged 30 years, nativity N. Y., occupation clerk, elevator boy, etc., was admitted to Georgetown University Hospital, October, 1908, with the following history: Had kyphosis since childhood and for several years had been troubled with disease of the left knee joint. Two operations of curetting and draining had been done without giving much relief. Examination showed a small, poorly nourished undersized man; the left knee joint had several scars about it and one open sinus from which pus was still discharged. There was ankylosis in a slightly flexed position. A diagnosis of tuberculosis of the spine and knee joint was made, healed in the spine but active in the knee. From October to January his condition was serious with a pulse of from 110 to 120, temperature 100° to 103° and so much pain in the knee that frequent use of anodynes was required The question was whether to amputate the thigh, to excise the knee and abolish the joint, or to excise the joint and replace it with a sound one. The operations were explained to the patient, who was quite intelligent, and he decided in favor of the method by transplantation although the chances of failure and the fact that I had never done the operation were clearly set forth.

Skiagram of transplanted knee joint taken 3 months and 25 days after transplantation.

An opportunity was afforded by the death of a patient on January 24, 1909. Consent was obtained from the deceased man's friends to remove his knee joint and this was done soon after death and the joint was placed in physiological salt solution until the diseased knee could be removed. Under ether the diseased knee was removed by a long incision on each side of the patella and a cross incision dividing the ligamentum patellæ. The patella

[1] Read at the first meeting of the Washington Surgical Society, March 17, 1911.

was turned up and the joint, filled with granulation tissue and pus, was exposed. The synovial cavity was scraped out and the soft parts carefully separated from the joint all around and for a space above and below of about three inches. The condyles of the femur and the head of the tibia were sawed off — two and one-half inches of bone being removed — of which about two-thirds belonged to the femur and one-third to the tibia. The section of the tibia was above the articulation with the head of the fibula. A corresponding length of joint was now sawed from the healthy joint, removing the patella but leaving the periosteum and all the ligaments in place and this new joint was placed between the sound ends of the femur and tibia and fastened with four wire and several catgut sutures. The patella was placed in position in front of the new joint and the ligamentum patellæ was united. The joint was too wide to permit closing of the soft parts, so the outer side was trimmed off, part of the femur and of the tibia, until it was reduced to the proper size. Opening for drainage was left on each side and the skin was united with silkworm sutures. Gauze and thick cotton dressings were applied. The transfer was made within three hours after the donor's death. There was almost immediate improvement in the patient's condition, pulse and temperature came down to 96 to 72 and 101° to 99°, respectively, and the pain was less, but suppuration continued and became more copious than ever as time went on.

April 16. The inner semilunar fibrocartilage having become detached was removed.

May 19. Union seemed to be complete as tested by the absence of motion between the fragments. A skiagram of the knee was taken at this time and it showed the parts in good position but no new bone could be recognized. (See skiagram.)

July 2. Suppuration continues, iodoform emulsion in glycerine used daily after irrigation with salt solution. The outer side has about closed but the inner side is still open over a space of about one inch. The piece of wire uniting the portions of femur became exposed and was removed.

September 2. Patient is doing well except for the suppuration. A portion of the transplanted condyle of the femur which was exposed was cut off with bone forceps. Free bleeding followed showing undoubted vitality of the bone.

March, 1910. Granulations are seen covering the exposed portions of the transplanted femur and tibia.

From this time on there was little change. The suppuration continued freely, requiring daily dressing, but the temperature and pulse were not high, ranging from 98.6° to 100° and 72 to 90, respectively, and the patient often expressed himself as feeling more comfortable than he had felt for years.

During the first week in August patient began to lose his appetite, he complained of pain in the hump on his back which became sore from pressure.

About August 10th a profuse diarrhœa set in and death occurred August 14th, one year six months and twenty-one days after the operation.

Permission was obtained from the patient's relatives to examine the knee. Dissection of the parts involved in the operation revealed the following: The transplanted parts had been largely absorbed and their place taken by new bone which had grown into them, at least two-thirds of the foreign bone had disappeared. This was more marked in the tibia, only a thin shell of which was left. Superficial caries existed in the exposed parts which had never healed over. The cartilages had all disappeared. There was only partial union in the femur but fairly good bony union existed in the tibia. There was no union of the articular surfaces with one another except of the patella, which was slightly united by bone with the new portion of the femur which had partially replaced the transplanted portion. It was evident from this examination that a process of absorption of the transplanted parts was going on as the new bone formed and took its place, the new bone gradually eating up or causing the absorption of the foreign bone.

While the operation in this case was a failure, chiefly on account of the unfavorable conditions which existed, enough was learned to strengthen my belief in the success of the operation in better selected cases.

ONE HUNDRED CONSECUTIVE CASES OF PELVIC AFFECTIONS IN WHICH VAGINAL DRAINAGE HAS BEEN EMPLOYED

By A. W. ELTING, M. D., and J. L. DONHAUSER, M. D., Albany, New York

THE draining of the peritoneal cavity dates back, so far as we may judge, to the time of Celcus, who described the drainage of that cavity by means of lead and brass tubes. In the fifteenth century we read that they were still used by Jerome of Brunswick, both for the peritoneum and for deep wounds. In the sixteenth century Ambrose Pare, Guillemeau, and others, used drainage tubes which, according to Godlee, were similar in many respects to those of modern times. In the seventeenth century we find Scultetus and others, who were most enthusiastic in draining wounds. In the eighteenth century, Bell intimates in his writings that the draining of cavities was becoming a most disputed question. Modern surgery claims as the pioneers in abdominal drainage the names of Peaslee, Sims, and Chassaignac. Thus Peaslee, in 1855, passed a green elastic catheter through the vagina and back of the uterus into the peritoneal cavity (cul de sac), "expecting that the immensely distended peritoneum would continue to secrete the ascitic fluid." Sims used this method for a considerable length of time. Chassaignac, in 1859, introduced soft rubber tubes into surgery. In 1863 Koeberle first spoke of the glass tube. Anspach tells us that this was soon followed by the glass tube and wick of Sanger, and then by the Mikulicz gauze bag. From time to time various materials have been used for peritoneal drainage, such as strands of catgut, wisps of horse hair, elastic bands, etc. Thus the trend of abdominal surgery was decidedly in favor of drainage until the report of Olshausen's series of cases in 1882; this publication apparently had a great influence in the general abandonment of drainage in gynecologic work. In 1897, John Clark published a most extensive article in which he condemns for the most part, all forms of drainage following pelvic operations. In 1905, J. L. Yates' work on "An Experimental Study of the Local Effects of Peritoneal Drainage" appeared. From an experimental standpoint, at least, Yates' findings have largely contributed to our knowledge of the phenomena of drainage. From that time to the present, various articles have appeared, one of the most important of which is that of Hartmann and Metzgar, which appeared in June, 1910. It is not the purpose of this report to dwell at length on the literature bearing on the efficacy of the various types of drains and the history of each; the main questions which interest the writers are:

1. Should the drain be looked upon as a relic of obsolete pelvic surgery?

2. In what types of cases shall drainage be employed?

3. Shall the abdominal or vaginal route be used in the placing of pelvic drains?

Times have of course changed since Peaslee inserted into the peritoneal cavity through the vagina, a catheter, for drainage. The conditions under which the modern surgeon works are more advantageous to success; the metamorphosis of septic into aseptic and antiseptic technique has revolutionized our idea of infection — and the anxieties for our postoperative cases have been reduced to a minimum. The wonderful power which the peritoneum possesses of taking care of toxic materials and of destroying foreign bodies has been well illustrated by Yates and others. The phagocytic function of the leucocytes, all indeed tend toward making the surgeon feel that he is working under advantages not enjoyed by the surgeons of bygone days; and yet we must quote Joseph Price who tells of Keith once saying "After all, where would we be without drainage?"

Pelvic and abdominal drainage signify different propositions; the one implies drainage from a deeply situated almost circumscribed cavity; the other represents the drainage of one wide and diffuse area whose limits are almost endless, whose boundaries are immense. The draining of simple abscess cavities wherever they may be implies the placing of a drain into a limited area; the draining of a general peritonitis case implies the placing of drains in sites, some of which may drain exudate; others may not. The difference in the virulence of the infections in cases of general peritonitis due to causes other than pelvic origin and those of pelvic origin are so marked that a general consideration of that question must be had before arriving at any conclusions as to when and when not to drain. In cases of general peritonitis due to a ruptured viscus such as an appendix, perforated duodenal and gastric ulcers, the offending organism is generally b. coli., staphylococcus, streptococcus, and occasionally the typhoid bacillus. In cases of general peritonitis due to an acute endometritis, ruptured

pus tubes, infected extrauterine pregnancies, and ruptured ovarian cysts (a most rare condition) by far the most common cause is the gonococcus, though the streptococcus, staphylococcus, and occasionally the pneumococcus are found. In acute pelvic inflammatory disorders the gonococcus is usually the predominant organism, though in these same types of cases following an abortion or criminal types of induced labor the virulent pyogenic organisms usually play the most prominent part. The exudate which so often covers the surrounding tissues of a cyst with a twisted pedicle is usually sterile, although the ordinary pyogenic bacteria may exist as a secondary infecting factor.

A number of investigations have been made along the lines of gynecologic bacteriology. Among the pioneers in that work should be mentioned Miller, Shauta, Reymond and Magill. They practically all agree in the scarcity of organisms found in pus tubes in general pelvic inflammatory disorders and in abscesses of the cul-de-sac; the exudate is usually sterile though in a fair number of cases the gonococcus may be found in small numbers which from cultural growth are not active as regards virulence. It may be stated that if, as is rarely the case, the infection is due to the common pyogenic bacteria the number of organisms found is greater and the cultural growth shows a more virulent organism. The clinical history together with the ward notes very often lend much light on the true nature of the infection; and yet at the time of operation it often happens that a surgeon opens an abdomen without having an accurate idea as to the real offending organism and to the condition existing within the abdomen. A degree of uncertainty very often exists as to the condition after the interior of the abdomen has been inspected; and we are then brought face to face with the proposition as to whether or not to drain. It is the writers' opinion that in those types of cases where there is a free purulent exudate within the peritoneal cavity, of course, barring the inflammatory types of serous exudation in which the tissues are simply giving forth an irritation exudate, as it were, drainage is indicated.

A smear taken at the time of operation has been proposed by some, in fact, some surgeons do this as a routine and employ drainage where the smear is positive for the ordinary pyogenes and sometimes when the gonococcus is demonstrable; on the other hand though a smear taken at operation may tell us something, all who are well acquainted with bacteriologic work know that a negative smear means but little and that a most virulent organism may be present though not detected by a smear. It is a well known fact that cases now and then come to autopsy which show a general purulent peritonitis due to a ruptured pus tube, in which the condition has not been recognized clinically and in which there was no history of abortion or gonorrhœa; if a series of cases were to be taken, such incidents we believe would be more frequent than is now supposed.

There are other pelvic conditions which demand drainage at the time of operation, besides the presence of pus. Thus the wounding of a portion of gut, bladder, ureter, or the lowest part of the rectum may demand drainage; this is especially so where an extensive tear occurs in the ileum or colon, since the study of the intestinal flora has told us that the virulence and the number of the bacteria of the intestine increase in proportion to the distance from the duodenum and attain their maximum at the ileocecal valve. (Cushing, Gilbert, and Domenici.)

A careful review of the literature of abdominal drainage from the standpoint of the indications and contraindications for abdominal drainage following pelvic operations reveals the fact that after all has been said for and against the draining of the peritoneal cavity the vast majority of those who have contributed to the literature conclude by giving certain indications which demand drainage; when summarized the indications as proposed by them are practically the same. A brief survey of a few of them follows.

Anspach states that in pelvic surgery experience has shown that drainage is indicated under the following instances:

1. When the small intestine, rectum, or sigmoid has been injured.

2. Where a large amount of exudate or a considerable portion of an abscess sac must be left behind.

3. To favor hæmostasis and to provide free exit in cases of extensive oozing.

Kustner of Breslau has written an extensive monograph on the subject and in it he says that the indications given by Burkhard, Hofmeier, and Fehling are the ones with which he agrees. These writers advise drainage:

1. If during the operation an injury has occurred to gut or bladder, whether a previous communication between one or both of these organs and the organ (usually a tube) that has been removed has existed or not.

2. When a pus collection has been found during a laparotomy which has not been opened for any reason during the operation and if one wishes to

open it secondarily or there is a possibility that it might open itself secondarily. This the writers claim does not apply to pus tubes or purulent adnexa, as they should be removed in entirety.

3. In parenchymatous hæmorrhage which can be checked in no other way, such as occurs occasionally after the freeing of adherent tumors or adnexal sacs.

4. When a large amount of pus has contaminated the field of operation and there is a possibility that the general peritoneal cavity has been soiled.

Kustner states that the last indication is absolutely opposed by Olshausen, though Pozzi heartily favors it.

Noble's indications are:

1. When the integrity of the bowel, bladder, or ureter is open to suspicion.

2. When abscess sacs cannot be completely removed, so that what the older surgeons called a "pyogenic membrane" must be left behind.

3. When suppuration exists as a complication.

4. When it is not feasible to arrest oozing from extensive raw surfaces, especially after the removal of intraligamentary tumors accompanied by pelvic exudate.

In Clark's monograph on peritoneal drainage the writer quotes a series of indications for peritoneal drainage taken from the report of the Johns Hopkins Hospital of 1890 and summarized by H. Robb. They are:

1. To provide a means of escape for the serous oozing which follows the separation of broad adherent surfaces.

2. To guard against pelvic peritonitis from retained pus from tube, ovary, or other viscus.

3. To remove fluid in cases of persistent capillary hæmorrhage.

4. To provide against hæmorrhage when the pedicle is dropped.

5. To drain the peritoneal cavity and starve out the disease in cases of chronic or tuberculous peritonitis.

The above quotations include only a small number of opinions but it may be stated that they practically cover the indications for peritoneal drainage after pelvic operations, as laid down by the vast majority of pelvic surgeons.

On the other hand there are those who absolutely oppose all forms of drainage after pelvic operations; thus Olshausen reported that he had about abandoned any kind of drainage after abdominal operations, with the possible exception of those cases in which there is uncontrollable hæmorrhage or in the presence of "perityphilitic abscesses. Anspach has thoroughly reviewed Olshausen's report and it is interesting both from the standpoint of the cases themselves and because of the utterance of such a radical measure; of the 1,555 cases which Olshausen has reviewed there were 114 cases in which he deemed drainage advisable, but did not use it. Anspach's review is as follows: 65 cases belong to the class where "Pus or necrotic material" has been spilled during the operation into peritoneal cavity, and resulted in 14 deaths; ten (10) belong to the class "When a malignant tumor cannot be fully extirpated or when an infiltrated abscess wall is left behind," — one (1) death; twenty (20) belong to "The penetrating wounds of the bladder or intestines"— seven (7) deaths; eighteen belong to the class "Operations which may be characterized as unclean, in which a large quantity of fluid must remain in the peritoneal cavity"— one (1) death. Zweifel records 140 cases of pyosalpinx operated upon without drainage with a mortality of one death.

In 1897 John Clark's article appeared; in it he discusses the advantages and the disadvantages of drainage following pelvic operations. His conclusions are as follows:

1. Under normal conditions the peritoneum can dispose of pyogenic organisms in varying quantities depending upon the virulence of the organisms without producing peritonitis.

2. The less absorption from the peritoneal cavity the greater the danger of infection.

3. Solid sterile particles are partly absorbed and the remainder is encapsulated without the production of peritonitis.

4. Death may be produced by septicemia and not peritonitis, where large quantities are taken up by the lymph streams.

5. Peritonitis may be produced if the culture fluid is difficult of absorption.

6. Irritant material which destroys the tissues of the peritoneum prepares a place for the lodgment of organisms and the starting place for peritonitis.

7. An infected stitch-hole tract or a localized phlegmon communicating with the peritoneum forms an excellent starting place for a general peritonitis.

8. Stagnation of degenerated fluid in dead spaces favors the growth of organisms.

9. The presence of infected blood clots is especially liable to cause a virulent peritonitis.

10. Injury to the abdominal viscera, such as strangulation of an intestine, constriction and ligation of large areas of tissue in the presence of

pyogenic organisms will almost invariably be followed by peritonitis.

It may be gleaned from the above that Clark showed a decided tendency toward the abandonment of drainage in pelvic cases. These conclusions have been based both upon clinical and experimental work; he reviews a series of 100 drained and 100 undrained cases, and reports a mortality of 6 per cent in the undrained cases and 13 per cent in those that were drained: of the undrained cases one pelvic abscess developed after the operation, while eight similar complications developed in the drained ones. Clark states that the types of cases in both series are similar. The literature which has appeared since Clark's monograph on the subject of peritoneal drainage is limited, and it is therefore difficult for any one at the present time to draw conclusions as to the general consensus of opinion regarding peritoneal drainage in conjunction with pelvic operations.

In none of the series which have been reviewed has the kind and location of the drainage been dwelt upon. It is however interesting to note that Clark summarizes his opinion as regards pelvic drainage as follows: "If the pelvis is to be drained the vaginal route is preferable: the dangers of infection are no greater and the dependent pockets in the pelvis can be drained much more effectively by this means." To Peaslee belongs the credit of being the pioneer in vaginal puncture, when in 1855 he boldly inserted a green elastic catheter by the vagina and behind the uterus into the peritoneal cavity (cul-de-sac of Douglas). Sims followed this method of drainage as routine for a long space of time. The text-books tell us little about vaginal drainage, though in Kelly and Noble's "Gynecology and Abdominal Surgery" some consideration is given to it, though in the writers' opinion the subject is not emphasized as it should be.

Olshausen states that "In doubtful cases of deep-seated pelvic suppuration in women, vaginal drainage is more reasonable than suprapubic."

Noble says that "When drainage is indicated after hysteromyomectomy except in the rarest instances vaginal drainage should be employed. The exception should be when the bowel has been injured at some point outside the pelvis, when an appendicular abscess exists as a complication or where there has been an extensive suppurative peritonitis." Kelly of Baltimore advocates its use. Baldwin in a recent communication speaks of the superiority of the vaginal drain. Yates mentions draining through the vagina though he does not seem enthusiastic on this route for drainage. Goldspohn recommends the combination of an abdominal and vaginal drain. Carstens punctures the posterior cul-de-sac and inserts a rubber T tube without gauze. H. Hartmann and Metzer in a recent article speak of the superiority of the vaginal over the abdominal drain in pelvic conditions.

From an anatomic standpoint the draining of the cul-de-sac through the vagina is by far the most logical method. The pouch formed as it is by reflections of the peritoneum lying deep down in the pelvis forms a cavity which cannot under any conditions be thoroughly drained by a wick or tube extending upward through the anterior abdominal wall. As Coffey states "Gravity performs the first step in all peritoneal drainage."

In the vast majority of pelvic cases which demand drainage the main site of difficulty is the cul-de-sac of Douglas; whether the condition is one of pyosalpinx abscess of the cul-de-sac, a fibroid tumor which is so tightly bound down to the surrounding tissue as to cause a raw bleeding surface when removed, in cases of large ovarian cysts whose walls cannot be entirely removed at operation and leave surfaces which cannot be covered with peritoneum, in extrauterine pregnancies whose rupture has occurred hours or perhaps days before the operation and in which dense adhesions have already been formed, in tuberculosis of the pelvic viscera and in cases of diffuse pelvic inflammatory disorders in which the removal of the pelvic viscera necessitates exposed, raw bleeding surfaces, the cul-de-sac of Douglas is the main site of injury and the main receptacle for the postoperative peritoneal oozing and purulent accumulations. The sero-sanguineous material which formerly was looked upon by the older surgeons as a "vicious substance" causing in most cases a general peritonitis, is of course to-day regarded as purely benign and will, under ordinary conditions, be well taken care of by the peritoneum; that it does however form a nutritive bed for the growth of bacteria is, we believe, denied by no one, and in all suspicious cases it must be looked upon as a harbor for germ growth. Barring for a moment cases in which pus is present, we know that however clean a vagina may be prepared there are organisms which though they are supposedly antibactericidal, in the vagina attain a certain virulence when introduced into the peritoneal cavity, and within a short space of time may change a purely sterile sero-sanguineous exudate into a purulent formation which may readily cause an abscess in the cul-de-sac. It often happens that even though the greatest care is exerted when amputating the

uterus at the internal os or in removing it entire, vaginal organisms are often unavoidably introduced within the general peritoneum. Under ordinary circumstances the benignancy of these bacteria and the ability of the peritoneum to take care of them affords the surgeon little concern and the abdomen is closed without drainage. Where there is extensive oozing from raw bleeding surfaces we deem it wiser to take no chances from postoperative infection and drain the cul-de-sac through the vagina. Where there is a likelihood of pus accumulation from pre-existing purulent conditions in the pelvis the vaginal drainage route is the one par excellence. When large accumulations exist in the peritoneal cavity due to either malignant conditions or to a general tuberculosis of the peritoneum apparently of pelvic origin, this method of drainage as proposed by Peaslee in draining ascitic cases is wonderfully efficacious. The question as to whether vaginal drainage affords a source of draining for more than a few hours has been disputed by some. The usefulness of the drain is supposed to stop when the meshes of the gauze have been completely filled; this condition applies to any kind of a drain whether it be abdominal, vaginal, or otherwise. Yates has well demonstrated in experimentation on animals, that all forms of drains were closed so that no drainage from the peritoneal cavity would take place after six hours; he determined this with carmine solution placed in the peritoneal cavity, but from the writer's knowledge no mention is made of the placing of fluffs of gauze or other kind of absorbent material over the points of delivery of the drainage gauze. Coffey, in his admirable article on the "Principles and Mechanics of Abdominal Drainage," criticizes his work from this standpoint and emphasizes the point thoroughly that "Gauze drainage must therefore be brought in contact with dressings or other absorbent substances if drainage is to be effectual." He further remarks that even though the gauze is surrounded, the end of the gauze must be in contact with the dressings. The combination of posture and the increasing of the capillarity by the frequent changing of the gauze fluffs or pads placed over the gauze drains, serves admirably. This may be proven by the fact that the dressings though frequently changed are saturated after each dressing for a period of hours which may extend into days.

The following series represents cases all of which have been operated upon in the dorsal position and all of which had the drainage material placed in the peritoneal cavity through a vaginal puncture made by an assistant. The technique is simple and with only a moderate degree of care, no difficulty will be experienced provided the assistant, during the puncture is sure of his markings and clean in his technique. This review comprises one hundred consecutive cases of pelvic disorders in which drainage was absolutely indicated. They represent the most serious and dangerous types of pelvic affections in hundreds of abdominal sections for disease of the uterus and adnexa. No case was drained before it had been thoroughly studied as regards its individual indication for drainage, and in summarizing it has been noted by the writers that each and every case comes under one or more indications cited in the beginning of the paper. The following represent the types of cases included in the series:

1. Abscesses of the cul-de-sac and multiple pelvic abscesses	11
2. Unilateral pyosalpinx with marked adhesions	10
3. Bilateral pyosalpinx with marked adhesions	27
4. Infected ovarian cysts	10
5. Benign uterine tumors with very marked adhesions	9
6. Cases of extensive chronic pelvic inflammation	24
7. Extrauterine pregnancies	3
8. Ruptured pyosalpinx	1
9. General peritonitis	1
10. Pelvic peritonitis apparently of appendical origin	4
Tuberculosis with pus	3
Tuberculosis without pus	2
Pus free in general peritoneum	36
Great oozing—no pus	52
Malignancy with marked adhesions	3
General purulent peritonitis due to punctured wound in uterus	1
Extrauterine pregnancy	3
Pus cases, including free pus in the peritoneal cavity, and pus sacs removed intact	65
For intestinal injuries during operation	9
For bladder injuries during operation	2
For oozing from marked adhesions leaving bleeding surfaces which could not be covered with peritoneum and which were either chronic pelvic inflammatory cases without pus or tumors	24
Number of cases that died:	
General carcinomatisis	1
Pelvic inflammatory disease cases	2
Large myoma and umbilical hernia	1
Tuberculosis of pelvic viscera	1
Ruptured uterus with septicemia	1
Complications:	
Drainage inserted through urethra	2
Postoperative pelvic abscess	1

TECHNIQUE OF VAGINAL PROCEDURE

After the abdominal operation has been completed an assistant introduces, through the vagina, a broad ligament clamp, using the forefinger as a guide; if the cervix has been completely removed the clamp passes directly to the center of the

posterior vaginal wall; if a portion of the cervix remains the clamp is introduced posterior to the cervix and then directly to the posterior vaginal wall. The operator guides, intraperitoneally, the clamp and when it has reached the posterior vaginal wall directs the assistant as to the proper tilt of the clamp; the proper site being selected the assistant is told to force the clamp against the posterior vaginal wall; the operator then makes a small incision in this area and the assistant then pushes the clamp directly through into the peritoneal cavity; the operator dilates the opening with a uterine dilator and while the clamp is opened introduces between its limbs a T tube rubber and 2 or 3 strips of vioform gauze, vaginal size, the ends of the strips directed upward allowing from four to six ends to be free in the peritoneal cavity. The assistant closes tightly the clamp and pulls the drainage downward until the gauze is flush with the vaginal outlet; the gauze within the pelvis is then loosely placed in the cul-de-sac while the tube is pulled outward until the T portion is directly upon the deep pelvic wall. This completes the procedure. The puncture and the placing properly of the drain should not occupy longer than the space of about three minutes.

A large factor in the success of this form of drainage depends upon the intelligent postoperative treatment of the case. As soon as the patient leaves the operating room she should be placed in either a Gorham bed or her bed should be so supported with bed blocks as to allow of an upright position. It is a general rule to immediately place the patient in an upright position provided the pulse warrants; in such cases position is assumed as soon as the patient has become somewhat stimulated and the heart can stand the position. As a rule the patient is given a continuous saline by rectum according to the Murphy method and in order to insure of free flushing of the kidneys, between 750 and 1,500 cc. of saline solution is given under the breast, the amount to a certain extent depending both on the general condition and the weight of the patient. Water is given quite freely as soon as the patient fully reacts from the anæsthetic; the above rule however does not hold in the case of one of general peritoneal infection. The nurse is instructed to change the vaginal dressings as soon as they have become saturated.

The above tables show in detail the types of cases which have been considered worthy of vaginal drainage. A careful analysis of the charts of those who have succumbed following the operation is most interesting and from an apparent mortality of 6 per cent we find that the death rate would be markedly less were we to eliminate those cases of postoperative nephritis and myocarditis and only consider the death rate from the standpoint of peritoneal infection. Of the 65 cases included under the heading of "pus cases including free pus in the general peritoneal cavity and pus sacs removed intact," one case died; it is hardly fair to include this in the series inasmuch as the patient came to the hospital with all the clinical manifestations of a general infection, secondary to a ruptured uterus with general peritonitis. This patient died a few hours after the operation, and apparently from a definite septicemia. Two cases (one of general carcinomatosis with a tearing of the sigmoid during the operation, and one of pelvic inflammatory disease without pus) succumbed to an acute nephritis; the first case voiding but 24½ oz. of urine in the four days and the other case but a slightly larger amount. At no stage were there any symptoms of a peritonitis. The case of large uterine myoma and umbilical hernia gave all the symptoms of a developing myocarditis which had a fatal termination. There were no evidences so far as clinical records go of a peritoneal disturbance. One case of pelvic inflammatory disease without pus at operation and one case of tuberculosis of the pelvic viscera showed some symptoms of peritonitis such as vomiting, abdominal distension, high temperature and the like; autopsies were refused in both cases.

The complications which developed were we believe remarkably few, considering the kind of cases in the series. Through some grave errors on the part of an assistant the drainage was twice introduced into the urethra and then directly into the peritoneal cavity; these mistakes necessitated a second operation which fortunately gave good results; though the urinary control was absent for a time. Within a space of a few weeks the patients developed perfect control.

One pelvic abscess developed which was relieved by puncture. A special point of interest is that though the vast majority of these cases were extreme, and presented the kind of conditions that predispose to intestinal obstruction, none developed.

CONCLUSIONS

1. The insertion of pelvic drainage through the vaginal route should occupy an important place in gynecologic surgery.

2. Though the gonococcus is a comparatively benign organism in the peritoneal cavity, one should always consider the possible presence of

other pyogenic bacteria, and provide, in the presence of pus, for drainage.

3. Smears taken at the time of operation are interesting in clinical notes but should not be regarded as of much importance in the determination of advisability of drainage; this is especially true of smears which show no organisms.

4. When vaginal puncture is employed, the Fowler position should always be used and the vaginal dressings frequently changed.

5. Vaginal puncture guards against postoperative intestinal obstructions by reason of its lessening to a marked extent postoperative adhesions in the pelvis.

6. In cases of extreme oozing it provides an exit for the serum for hours and perhaps days, provided the proper dressings are applied.

7. A fair knowledge of the anatomy of the vagina and the pelvis is necessary before one attempts to perform a puncture.

8. No cases of pelvic affections should be drained unless indicated in one of the conditions above cited in this paper.

BIBLIOGRAPHY

OLSHAUSEN. Zeitschrift fur Geburtshülfe und Gynäkologie, lxviii, heft 2. Reviewed in Annals of Surgery, 1903, xxxviii, pp. 139–140.
MOYNIHAN. Abdominal Operations. W. B. Saunders and Co., Philadelphia, pp. 19–21.
SELLMAN. American Journal of Obstetrics, lx, p. 899.
BALDWIN AND GOLDSPOHN. American Journal of Obstetrics, lx, p. 898.
CARSTENS. American Journal of Obstetrics, lx, p. 899.
CLARK. American Journal of Obstetrics, 1897, xxxv, p. 656.
BALDWIN. American Journal of Obstetrics, lxi, p. 76.
KÜSTNER. Reviewed in Surg., Gyn. and Obstetrics, 1905, vol. i, p. 375.
HARTMANN AND METZGAR. Annales de Gyn. et d'Obst., xxxvii annee, 2 series, tome vii, June, 1910, pp. 320–349.
COFFEY. Jour. of A. M. A., xlviii, 1907, pt. 1, p. 937.
PEASLEE. American Journal of Obstetrics, 1870–71, iii, p. 300.
YATES. Surg., Gyn. and Obstetrics, 1905, vol. i, p. 473.
Trans. Am. Surg. Assoc., 1903, xxi, p. 23.
Godlee Practitioner, xliv, pt. 1, 1890, p. 97.

CORRESPONDENCE

A QUESTION OF PRIORITY

BY D. TOD GILLIAM, M. D., COLUMBUS, OHIO

In the April issue of Surgery, Gynecology and Obstetrics is an article by Dr. S. E. Tracy of Philadelphia entitled "Closure of the Abdominal Incision"; the technique of which, so far as I can see, is in every essential detail identical with that described by myself in the same journal in January, 1909, under the head of "Coaptation and Imbricating Suture for Closing the Abdominal Incision." I have been using this method continuously since that time and for some time before, as also have others with most pleasing and satisfactory results. While I do not feel like yielding to Dr. Tracy priority in evolving the suture, I have not the shadow of a doubt but that the thought was as original with him as with me and am pleased that he should have substantiated my own estimate of its value and efficiency. I should farther state that other surgeons are, and have been using this suture with most gratifying results.

TRANSACTIONS OF SOCIETIES

THE AMERICAN GYNECOLOGICAL SOCIETY

THIRTY-SIXTH ANNUAL MEETING, HELD AT ATLANTIC CITY, NEW JERSEY, MAY 23, 24, AND 25, 1911. THE PRESIDENT, DR. REUBEN PETERSON, ANN ARBOR, MICHIGAN, IN THE CHAIR

An address of welcome was delivered by DR. WALT P. CONAWAY of Atlantic City, which was responded to by DR. PHILANDER A. HARRIS.

THE TREATMENT OF PLACENTA PRÆVIA AT THE SLOANE HOSPITAL FOR WOMEN

DR. EDWIN B. CRAGIN, of New York, said that cases of placenta prævia occurring in 25,000 consecutive deliveries were presented for discussion of treatment and were divided into two groups, namely, series A, those occurring in the first 20,000 deliveries; and series B, those occurring in the last 5,000 deliveries. In series A, the cases of placenta prævia were treated by different methods: by Braxton Hicks' version and using the half breech as a uterine tampon, or by tamponade of the cervical canal and vagina, or by dilatation of the cervical canal by the Voorhees bags.

In series B, the methods of treatment in cases needing any treatment save that of a normal delivery could well be summarized as follows: 1. Dilatation of the cervix and control of the hæmorrhage with the largest Voorhees bag which could be introduced, i. e., No. 3 or 4. 2. After the largest bag had passed the cervix and good dilatation was obtained, either a version was done and the child delivered by the breech, or if the placenta prævia was lateral, or in some cases even marginal, with slight hæmorrhage, and the vertex was presenting, the membranes were ruptured and the head was allowed to come down and exert pressure on the lower uterine segment and the edge of the placenta, the delivery being expedited by the forceps if necessary.

This use of the elastic bag was extraovular, the membranes being kept intact until the bag passed the cervix and good dilatation was obtained.

The first question of importance in any method of treatment was the maternal mortality. In series B, treated by the present methods, there were 49 cases of placenta prævia, 14 of the complete, and 35 of the incomplete, variety. There were two deaths among those of the complete variety, or 14.2 per cent, and 2 deaths in the 35 in the incomplete variety, 5.7 per cent.

In series A, treated by different methods, there were 39 cases of complete placenta prævia with 9 deaths, or 25 per cent, and 135 cases of incomplete placenta prævia with 11 deaths, or 8.1 per cent.

As regards fœtal mortality in series B, treated by present methods, the total fœtal mortality was 51 per cent, while in series A, it was 60.3 per cent.

In series B, 63.1 per cent of the children viable on the admission of the mother left the hospital alive.

Regarding the question of placenta prævia being an indication for Cæsarean section, he could only state that he had never met with a case in which he had considered it indicated. He believed that the indication occasionally arose. He had recently performed it in a case of accidental hæmorrhage with long, rigid cervix, with profuse hæmorrhage, and believed that similar conditions in a placenta prævia might well indicate the same operation. That Cæsarean section was often indicated in placenta prævia he did not believe.

PLACENTA PRÆVIA

DR. EDWARD P. DAVIS, of Philadelphia, for clinical purposes, divided placenta prævia into partial and complete. Under the latter he included those cases in which the placenta, originally low, had entirely covered the internal os by an additional lobe connected with the greater placental mass by a membranous interval.

In partial placenta prævia hæmorrhage might be controlled by evacuating a portion of the amniotic liquid, stimulating the uterus to contraction, and forcing the fœtus down against the placenta. Such treatment was not difficult of execution, provided no essential disproportion existed between mother and child. Where delay in dilatation occurred the introduction of a good-sized bag through the ruptured membranes,

disturbing the placenta as little as possible, would greatly expedite delivery and control hæmorrhage. The Braxton Hicks' method was available in such cases, and if the operator avoided the mistake of proceeding to immediate delivery, it would give good results for the mother at the expense of the child.

Of late attention had been drawn to the value of intraovular pressure in placenta prævia by inserting, with suitable forceps, a good-sized bag through the membranes or placental substance, and by dilating this bag fully, thus controlling hæmorrhage through pressure and hastening delivery.

In partial placenta prævia treated with or without intraovular pressure by a dilating bag, the maternal mortality was not high. From rupturing the membranes in partial placenta prævia, Novak collected 163 cases, with no maternal mortality, and a fœtal mortality of 15.3 per cent. If the operator proceeded to immediate version and extraction, in 878 cases the maternal mortality rose to 8.8 per cent; the fœtal mortality to 71.8 per cent.

In Novak's collection of 2,081 cases, reported by different authors, by the various methods of treatment exclusive of Cæsarean section, the maternal mortality averaged 8.65 per cent; the fœtal mortality 56.72 per cent.

In central placenta prævia attention had recently been called to the disadvantage of former treatment by the use of the tampon. In spite of antiseptic precautions, infection was not common in these cases, and as this treatment was often employed in private houses, with deficient aseptic technique, infection must be frequent. The tampon did not perfectly control hæmorrhage and was but a temporary expedient to prepare the way for some method of delivery.

The high fœtal mortality of placenta prævia, treated by vaginal methods, and the considerable maternal mortality, suggested the possibility of delivery by abdominal section. The advocates of suprasymphyseal section urged its adaptability in these cases, and Pankow reported 8 successful cases. Sellheim by extraperitoneal section, in 8 cases secured the recovery of both mother and children. Vaginal Cæsarean section in Döderlein's clinic was performed ten times for placenta prævia, with the recovery of all the mothers and the greater part of the children.

The author had in three cases of central placenta prævia operated so soon as the diagnosis could be made out. The mothers recovered without incident; one normal child at term did well; the second child was a monstrosity, the third child, which was premature, did not long survive.

He believed there was a close analogy between ectopic gestation and central placenta prævia. In both the cardinal dangers were those of hæmorrhage and infection; in both palliative measures were insecure and unsatisfactory; in both operative treatment was the only reliable resource.

In the present stage of knowledge no method of treatment compared with abdominal Cæsarean section in central placenta prævia, if the lives of both mother and child were to be considered. The mortality of abdominal Cæsarean section in uninfected cases was now less than 2 per cent in a large number of cases, and the fœtal mortality in a considerable number was often nothing.

It was his belief that a considerable amount of bright vaginal hæmorrhage in a pregnant patient was always a dangerous symptom; and that during the latter months of pregnancy, mother and child being previously in good condition, such hæmorrhage should be considered as indicating a condition fully as critical as ectopic gestation. Such cases should be immediately seen by a competent obstetrician and a very careful examination made. Under favorable conditions delivery by abdominal Cæsarean section should greatly improve the chances of both mother and child.

A BRIEF ANALYSIS OF FORTY CONSECUTIVE CASES OF PLACENTA PRÆVIA

Dr. J. Clifton Edgar, of New York, said the general line of treatment in these forty cases consisted (1) in controlling the hæmorrhage and securing cervical dilatation by means of cervical and vaginal gauze packings; (2) completing the dilatation by means of bimanual cervical dilatation, the Pomeroy hydrostatic bag, or the modified de Ribes bag; (3) completing delivery by version and breech extraction, the forceps, simple breech extraction, or spontaneously; (4) the postpartum packing of the uterus to prevent further bleeding, and the use of hypodermoclysis, rectal and venous infusion, or other shock treatment; (5) The induction of labor.

Of the forty cases of placenta prævia, ten were central, nine partial, twenty-one marginal. Seventeen cases were ambulance or emergency ones. Seventeen cases were first seen at the onset of the bleeding; in twenty-three, the hæmorrhage had lasted from a few hours to several days. Twenty-three cases only were exclusively treated by the hospital, the remaining seventeen had received various treatments before entering this hospital service. In twenty-nine cases the cer-

vical dilatation was two fingers or less when first seen.

Treatment embraced (1) cervical and vaginal gauze packing in thirty-two cases; (2) de Ribes bags in three cases; Pomeroy bag in seven cases, bimanual dilatation as a primary measure in two, and gauze packings in ten cases. Induction of labor in nine cases. The methods of delivery were:

(1) Version and breech extraction in twenty cases; (2) forceps in six cases; (3) simple breech extraction in five cases; (4) spontaneous delivery in 8 cases; making, with one case undelivered, forty cases. Postpartum uterine tamponade in forty cases. The maternal mortality was 7.5 per cent. The infant mortality was 32.25 per cent.

CONCLUSIONS

1. Cervical and vaginal gauze packing was an efficient means for controlling hæmorrhage and securing dilatation in placenta prævia.

2. The maternal mortality of 7.5 per cent and infant mortality of 32.25 per cent were satisfactory, taking into account the fact that about half of the cases were ambulance or emergency cases.

3. Version and breech extraction had a higher infant mortality than delivery by the forceps, simple breech extraction, and spontaneous expulsion.

THE BEST AND THE WORST METHODS OF TREATING PLACENTA PRÆVIA

Dr. Henry D. Fry, of Washington, D. C., said the best and safest method to deliver a woman suffering from placenta prævia was purely an obstetric problem and its decision should rest with the obstetrician. Men who had handled these cases according to modern obstetric methods; who were familiar with the dangers incurred; who had learned to overcome the difficulties and dangers and knew the limitations of their art; they, and only they, should decide what method of procedure was best for each individual case.

Experience clearly demonstrated that maternal interests were guarded best by evacuation of the uterus as soon as the diagnosis of placenta prævia was made.

In the methods of treatment suggested by the Council for present consideration that classified as "c" was by rapid dilatation, version, and extraction. It was implied, but not stated definitely, that the procedure was accomplished at one sitting and that the dilatation was not only rapid but was carried to a degree to permit podalic version, while extraction of the infant was done by active measures.

Rapid dilatation of the cervix had no place in the treatment of placenta prævia, whether performed manually, by the Bossi dilator, or by vaginal Cæsarean section. Version by the podalic method was never advisable unless uterine action had softened and dilated the cervix sufficiently to insert the hand. Slow delivery of the infant should be substituted for extraction. Extraction implied the use of active measures, a *vis a fronte*, whereas the birth of the infant should be mainly by uterine action — a *vis a tergo*.

Rapid dilatation was accomplished by severe hæmorrhage from placental detachment and from uterine laceration during and after manipulation. After dilatation had been obtained in sufficient degree to allow the insertion of two fingers, further continuation of the process was likely to endanger the integrity of the soft parts. In other words, the artificial dilatation sufficient to perform bipolar version was comparatively safe, while that necessary for the insertion of the hand and podalic version was dangerous. After version had been accomplished, the leg, breech, and body of the infant successfully plugged the cervical opening, and by pressure against the area of uteroplacental detachment prevented the further loss of blood. Bleeding being absolutely under control, every effort should be made by slow delivery to secure dilatation and thereby prevent laceration of the lower uterine segment.

His rule was to discontinue anæsthesia after having performed version and to hasten uterine action by directing an assistant to rub the fundus of the uterus and by encouraging the patient to make use of her auxiliary muscles to supplement the uterine force. In multiparæ the average duration of labor under these circumstances was one or one hour and a half. Furthermore, it must be recognized that the danger was not over with the successful termination of labor. The mother had yet to run the gauntlet of postpartum hæmorrhage and sepsis.

The proper application of the intrauterine tampon of sterile gauze was a most valuable agent in safeguarding the patient from the disastrous consequences of further loss of blood. No substitute could be employed safely to control postpartum bleeding in these cases. The cause of death (the 36th case) in his own series of 38 cases was due to the imperfect manner of application of the gauze by the hospital interne.

Laceration of the lower segment of the uterus was a frequent cause of fatality in placenta prævia. The complication favored both hæmor-

rhage and sepsis, and next to hæmorrhage as a cause of death in placenta prævia was sepsis.

The area of placental detachment left a raw absorbing surface low down in the uterine cavity instead of at the normal site near the fundal end. Proximity to the vagina favored infection, while laceration of the parts opened the portal for entrance of pathogenic germs.

In placenta prævia the precinct immediately adjacent to the internal os must be regarded as sacred ground with the sign *noli me tangere*, therefore, the invasion of this part with the gauze tampon or with the rubber bag dilator was dangerous.

The least dangerous obstetric interference was that necessary to perform bipolar version. The fingers did not come in contact with the danger zone, but were passed through the internal os and directly within the ovular sac. The leg of the infant was brought down, the pressure was exerted from within the ovular sac outwards; the uterus was excited to contract; hæmorrhage was controlled, and if delivery was left to uterine action the dilatation was natural. Contrast also the duration of time involved in the employment of bipolar version and in the use of the rubber bag dilator. It was a question of minutes in the former, and of hours in the latter.

Regarding the indications for abdominal Cæsarean section in placenta prævia, he repeated the conclusions of his previous paper. It was advisable in central placenta prævia complicated by an undilated cervical canal. Not only must the cervix be undilated, but the tissue must be hard and unprepared for artificial dilatation. This condition existed only in about five per cent of all cases of placenta prævia, and was almost never met with in multiparæ.

Contraindications for abdominal Cæsarean section were (1) excessive loss of blood before the opportunity arose for performing the operation; (2) a soft and dilatable cervix; and (3) a partial or marginal placenta prævia. Previous attempts to dilate and deliver the case by the natural passages, the use of gauze tampons and rubber bags to control hæmorrhage, placed such cases on the undesirable list, and if subjected to surgical skill, a Porro operation should be substituted for Cæsarean section.

THE TREATMENT OF PLACENTA PRÆVIA

Dr. F. S. Newell, of Boston, said that the statistics of the treatment of complete placenta prævia showed in general practice a maternal mortality of approximately forty per cent. In clinics under the care of expert obstetricians the mortality had been reduced to between three and five per cent in the same type of cases. This variation could only mean one thing, that the condition was recognized and treated efficiently by the expert where it was palliated by the general practitioner. The important thing in treatment, therefore, was the early recognition of the condition and the prompt termination of the pregnancy.

The method of operative procedure must be chosen to suit the individual case; no rule to suit all cases could be laid down. He believed that in a patient at or near term, when mother and child were both in good condition and the soft parts did not offer undue resistance to dilatation, the best method of treatment was complete dilatation of the cervix, followed by immediate extraction of the child, believing that a slight risk to the mother was warranted for the sake of giving the child a reasonable chance for life. When the mother had bled sufficiently to be in anything but first-rate condition, the chances for the child were comparatively poor under any circumstances, particularly if it was markedly premature; therefore, the treatment to be adopted should be that which would give the least shock to the mother. This was, in his opinion, a partial dilatation of the cervix, bipolar version, followed by slow extraction of the child. This method of treatment of necessity sacrifices the child in the majority of cases, but risks the maternal life less than any other method which could be employed.

Cæsarean section in the treatment of complete placenta prævia should, in his opinion, be reserved for those cases in which the cervix was rigid, as would be seen occasionally in primiparæ or in multiparæ with cicatricial stenosis of the cervix, or patients in whom there was a marked degree of pelvic contraction present. If Cæsarean section was to be adopted as a routine treatment he believed that the maternal mortality would be markedly increased over what it was at present in cases under expert care.

DISCUSSION

Dr. Richard C. Norris, of Philadelphia, said that there were cases of placenta prævia which were best treated by abdominal Cæsarean section, but he believed also that combined experience taught us that the number of cases in which indications might arise to require this operation would always be limited, probably about five per cent of all cases of primiparæ. The ideal conditions for Cæsarean section were a rigid cervix, a viable child, a mother who was a good surgical risk, and the diagnosis made at an early period. In women stricken with central placenta prævia

the danger to life was so great that the life of the child must be considered a negligible quantity. We must not, in order to save the child's life, which was problematical, sacrifice the life of the mother. He would compare the opportunities for doing abdominal Cæsarean section in the treatment of placenta prævia to those of hysterectomy for puerperal sepsis.

The use of the intrauterine tampon to prevent postpartum hæmorrhage had been referred to, but in his experience we should lay stress on the point that the tampon must not only be intrauterine, but it must be firmly placed in the vagina so that the cul-de-sac must be filled and upward pressure made to control bleeding.

Dr. J. Whitridge Williams, of Baltimore, said, in regard to the treatment of placenta prævia, in cases requiring nothing more than rupture of the membranes, he had used exclusively the Champetier de Ribes balloon, and during this entire period he had no maternal deaths, so he considered the results extremely satisfactory. A dangerous method of treating placenta prævia in his experience was by rapid dilatation, either with the fingers or with some instrument. He saw in consultation women whose lower uterine segment had been torn, and in a number of cases he had been obliged to remove the uterus by abdominal section to overcome the damage done by this treatment. As to abdominal Cæsarean section, the indications for it were so extremely infrequent that one could do without it, and he had not been able to see the justice of the mode of reasoning of the Germans who had been extremely enthusiastic over it.

Dr. Walter P. Manton, of Detroit, Michigan, had used all of the methods that had been advocated except Cæsarean section, and he did not recall having seen a case where he thought this operation would be applicable. In the last 1,989 cases of confinement at the Women's Hospital in Detroit, they had had 19 cases of placenta prævia, and in only one was the placenta centrally implanted. In his own experience he had never lost a mother with the methods that had been advocated. The infant mortality had been between 50 and 60 per cent, although he had not the exact figures.

He had not had great success with the Braxton Hicks' method of bipolar version, but by the use of the de Ribes bag and Voorhees bags his patients had come through safely, although the infant mortality had been high. A large percentage of the cases had been treated by the general practitioner first, and perhaps infected, and in a goodly percentage of cases the child was dead before the specialist was called in. What was said here should have particular reference to the general practitioner as well as the specialist.

Dr. Philander A. Harris, of Paterson, New Jersey, had done practically no obstetrics in the last few years. Occasionally he saw a case, so that he had not advanced much in the treatment of cases of placenta prævia, and he had been forced to stop with a maternal mortality of one per cent in less than sixty cases of placenta prævia of all kinds. He had invented a metallic instrument for dilating the cervix, but as it was unsatisfactory he returned to the method of dilating the cervix with the hand, and when one of the speakers referred to the disadvantage of manual dilatation he wondered whether he was not really wrong as to definition. A hand, which was dilating a cervix of a certain size, could easily tear it, and he wondered whether the gentleman who objected to these methods, which in his hands had been satisfactory, had not torn the uterus over and over again, instead of taking the matter in deliberate fashion and dilating the cervix. He said this in behalf of a method which he thought had been dangerously used. The knife was a useful thing, but we had seen it do harm.

Dr. William S. Stone, of New York City, mentioned a case of accidental hæmorrhage in which he decided to do the vaginal operation after the patient was on the table, as the conditions were such that it was the easiest and quickest way to remove the contents of the uterus, and it proved to be such. He had never done vaginal Cæsarean section for true placenta prævia.

Dr. J. M. Munro Kerr, of Glasgow, Scotland, said that in the treatment of placenta prævia we must distinguish between domestic and hospital practice, and he was perfectly convinced that in domestic practice we could do no better than follow the advice of Dr. Fry, namely, to do version by the Braxton Hicks' method. That was the problem for the general practitioner. In the Glasgow Maternity Hospital they had tried chiefly two treatments — bipolar version, and the treatment by bags—and so far their results had differed very little by the use of the two methods. They had, if anything, a little lower fœtal mortality, and, if anything, a slightly lower maternal mortality, but it had been very slight indeed, and consequently he could understand very clearly the attitude of those who supported the use of the bag and bipolar version.

But the real point of importance at the present time was the position of Cæsarean section. This operation in domestic practice had a place in skilled hands, but he was rather inclined to

believe that they had given it rather half-hearted support. There were certain cases in which Cæsarean section was called for. Dr. Norris had defined the indications for it. They were: (1) A child must have reached nearly full term. (2) The child must be viable and in good condition. (3) That there must probably be a defect in delivery, either in regard to the pelvis, slightly small, or as regards rigidity of the soft parts. (4) It should be employed in women late in life who must possibly have another chance to bear a child. (5) The operation should only be employed where there had been danger of infection. He thought if he gave it out as decidedly the opinion that in cases of that sort Cæsarean section was indicated, we would put the position of this operation on a proper basis, and in the future we might possibly be able to extend it or make its application less limited.

AN INVESTIGATION OF THE USE OF IODINE IN SKIN STERILIZATION FOR SURGICAL PURPOSES

Dr. J. Wesley Bovee, of Washington, D. C., summarized his observations and experiments as follows:

1. So far as can be ascertained by culturing epidermic scrapings, weak dilutions of iodine, even to five per cent of the official tincture, thoroughly sterilize the surface of the skin for a period of time lasting from two minutes after its application to fifteen minutes after. While this inhibitive action of absolute alcohol is quite potent, this property is greatly enhanced by the addition of iodine to an equivalent of five per cent of the U. S. P. tincture.

2. Pubic hair placed in iodine dilutions of 5, 10, 20, 30 and 40 per cent strength (of the official tincture), respectively, for 2, 3, 5, 8, 10, 12 and 15 minutes, respectively, all showed growths after three days' incubation, while using 50 per cent dilutions under the same conditions practically always prevented growths.

3. Control scrapings of skin taken from the abdomen above the umbilicus over periods of time varying from two minutes to two hours, when 40 per cent dilutions were used, always showed negative results as to colonies.

4. Cultures from hair and skin that had been subjected to 50 per cent dilution of tincture of iodine never produced growths.

5. Tincture of iodine diluted with an equal amount of absolute alcohol may be considered reliable as a local application in preparation of the skin or mucosa in any part of the body. Dilutions of less strength are unreliable if hairs or large hair follicles are in the field of operation.

6. The fifty per cent dilution of tincture of iodine, if not carelessly applied, is not liable to injure the skin.

DISCUSSION

Dr. Edward B. Cragin, of New York City, said he was a strong advocate of iodine after the other methods of sterilization had been employed. He did not think that we ought to rely on it entirely, as some men were inclined to do, but should use it as an additional safeguard. He had used it for a year past and had been very favorably impressed with it.

Dr. I. S. Stone, of Washington, D. C., said there could be no two opinions in Washington with reference to the use of iodine for sterilizing the skin. He knew of nothing which had been so satisfactory as an antiseptic to the skin. He had reduced the strength to twenty-five per cent. If one could get sterilized catgut, if he could sterilize catgut better with iodine than with any other sterilizing agent, short of heat, surely its penetrating qualities should be an indication for its use on the skin. He had never seen a case in which iodine had been used where the wound had broken down. There had been some cases where there was superficial separation of the wound. This might have been from subsequent contamination; it might have been from the catgut, but he had never known a deep-seated separation of the wound to occur since he had used this method.

Dr. Brooks H. Wells, of New York City, had employed iodine in a good many hundred cases in his service at the Policlinic in New York, with uniformly good results. He had not had any cases where there was serious irritation of the skin, and he had not had any case of superficial necrosis. The skin should be perfectly dry before the iodine was put on, and, in the next place, during the preliminary preparation of the skin one should not apply the strong solutions of bichlorid of mercury. If one applied a solution of bichlorid of mercury to the skin and allowed the skin to dry, and then painted the iodine on the skin, he was apt to get serious irritation.

Dr. A. Lapthorn Smith, of Montreal, stated that he had used iodine for sterilizing the skin with very satisfactory results. Occasionally, he had used it in emergency cases during pregnancy, and in a few other instances where he had to operate quickly, and the results were just as good as if he went through the many different preparations advocated by others.

Dr. B. M. Anspach, of Philadelphia, stated that at the University Hospital, in the service of Dr. Clark, they had been using iodine for

sterilizing the skin for a year and a half. The method they used at first was to have the patient take a general bath before the day of operation, paying particular attention to the umbilicus and pubes, then to dry the skin thoroughly, and apply the official tincture of iodine. A dressing was applied over this by the nurse, and the application was repeated on the following morning. With a ten per cent solution or the official tincture they had seen an extensive blistering in some cases. This was painful and prevented the operation from being carried out when anticipated. Since that time they had reduced the strength to five per cent and had employed the same method entirely, not using alcohol or bichlorid of mercury preliminary to the application of the iodine. They had used iodine in a series of about four or five hundred cases with gratifying results.

Dr. J. M. Baldy, of Philadelphia, stated that he had a profound mistrust for anything which relegated to the shades water and soap and the nail brush. Those gentlemen who had been using iodine for sterilizing the skin were getting perfect results according to their statements. On the other hand, the same gentlemen who had been practicing surgery for fifteen or twenty years to his knowledge had made equally positive statements in regard to the value of past methods. What had prompted them to change to the use of iodine? Did they tell the truth about past methods? If they did, why were they changing and looking around for new drugs? He must say, there was a heap of mistrust in these discussions as regards the actual truth of what they were talking about. He did not deny the fact that sterilization of the skin with iodine would kill germs, but who cared for germs as long as they did not produce sepsis.

Dr. Leroy Broun, of New York City, stated that he had used iodine at the Women's Hospital, and had done so for ten months, although he had gotten no better results by using it than he had been getting before. The results before its use were satisfactory. Occasionally there was breaking down of a wound, especially when he operated on cases where the pus was bacterially active. In two instances he got severe blisters on the abdomen, and this was sufficient for him.

Dr. Lewis S. McMurtry, of Louisville, believed that all the gentlemen who were using tincture of iodine for skin disinfection could obtain the same results by very much simpler and easier methods than by the iodine treatment. For instance, last summer he made a vacation visit to the clinic of the Drs. Mayo, and all of the patients prepared for abdominal section were painted with tincture of iodine (fifty per cent solution) in one room, and the operations were done in another room; the other patients were treated in the ordinary customary way which was now in vogue by surgeons everywhere, simply cleansing the skin without nail brush and without traumatizing the skin. The patient received a warm bath the day before. The skin was washed off with soap and water the night before, and then when the patient was brought to the operating table he or she received another cleansing with soap and water and the results were the same by the two methods. There was no advantage whatever in the germicidal treatment of the skin by tincture of iodine. This was tested in a series of more than one hundred cases by the Mayos in each room and the results were the same by both methods.

A FURTHER CONTRIBUTION CONCERNING THE FREQUENCY AND CLINICAL SIGNIFICANCE OF FUNNEL PELVES

Dr. J. Whitridge Williams, of Baltimore, in a paper on this subject drew the following conclusions: 1. In typical funnel pelves the distance between the tubera ischii was reduced to eight centimeters or less, while the usual measurements remained unchanged. 2. Such pelves were noted in 6.1 per cent of 2,215 consecutive full term labors, were of equal incidence in white and black women, and sometimes gave rise toserious dystocia. 3. The funnel pelvis was the most common abnormality in white women, in whom it constituted forty-four per cent of all deformed pelves. In colored women, on account of the incidence of the more usual types, it was relatively less important, and stood forth in order of frequency. 4. The prognosis depended not so much upon the actual narrowing of the pubic arch or upon the distance between the tubera ischii, as upon the relation between it and the posterior sagittal diameter. 5. Moderate degrees of dystocia could frequently be overcome by placing the patient in an exaggerated lithotomy or an exaggerated Sims' position. In either event, the antero-posterior and posterior sagittal diameters underwent an average increase of 1.62 cm., which so increased the available space as to make spontaneous labor possible. 6. Such an enlargement afforded an explanation for the successful outcome of certain low forceps operations which appeared theoretically impossible from the measurements taken in the usual position. 7. Pubiotomy was the operation of choice in cases of pronounced dystocia, as it not only effected the delivery of the child,

but led to a permanent increase in the size of the outlet, which might be further enlarged by the softening of the fibrous union under the influence of the hyperemia incident to pregnancy, and thus made possible the spontaneous termination of subsequent labors.

DISCUSSION

Dr. Edward Reynolds, of Boston, stated that the inferior strait of the pelvis was of vastly more importance than the gynecologist had supposed, and was probably of more importance than the superior strait. Dr. Williams had had the courage and intelligence to throw the traditions of the past overboard and approach the obstetrical pelvis from the point of view of common-sense and sound mechanics, and he had revolutionized our views of the contracted pelvis, in connection with labor. He had shown wisdom in his first publications by directing our attention to that part of the pelvis which was most easily susceptible to measurements in labor.

Dr. Edward P. Davis, of Philadelphia, desired to call attention to the fact that in cases of dystocia from funnel-shaped pelvis, where the obstetrician was called in consultation because the family physician could not secure expulsion of the child, or found it difficult to extract it, the instrument slipping, and the head of the child being low down, it was the duty of the practitioner to perform craniotomy, as such cases could not be treated safely in any other way.

DIAGNOSIS AND TREATMENT OF CONTRACTED PELVES

Dr. J. M. Munro Kerr, of Glasgow, Scotland, read a paper on this subject, which appears in this issue. (See p. 1.)

DISCUSSION

Dr. J. Whitridge Williams, of Baltimore, noted with interest the number of spontaneous deliveries reported by the essayist, which was somewhat less than the number in his hands. In the 2,200 cases upon which his article on funnel-shaped pelves was based, there were sixteen per cent of spontaneous deliveries in all classes of inlet contraction in white women as compared with eighty-one per cent in black women.

Dr. A. Lapthorn Smith, of Montreal, stated that the author of the paper had sounded an important note to the teachers of obstetrics both in this country and in the old country with reference to teaching young men to take more time and allow nature more time to effect delivery in these cases of contracted pelvis. The tendency to hurry matters in these cases was a curse rather than a blessing, and it came about very largely from conditions peculiar to this country. In America the doctor was told to hurry up or the women would get somebody else, and it was this hurry-up spirit which made it difficult to instill into the mind of the young doctor the important point that he must not hurry delivery until the time came for it to be effected.

Dr. Richard C. Norris, of Philadelphia, said that his attitude towards inducing labor in properly selected cases not more than two or three weeks before the calculated term would add to the table of spontaneous deliveries given by the essayist. It was in this class that induced labor should be considered.

The question of transperitoneal and intraperitoneal Cæsarean section had never appealed to him. He believed that craniotomy was yet a conservative operation, which must be used in certain instances. He had twice in the past year been called upon to perforate the head of the living child.

Dr. Henry D. Fry, of Washington, D. C., stated that in that city they had a large colored population and he had noticed in examining a large number of pelves that fully fifty per cent of the women had justominor pelves. It was rather unusual for him to find in colored women a rachitic flat pelvis, but the justominor pelvis was a very common contraction. In the white women the justominor pelvis was rather unusual, and the simple flat and rachitic flat pelves were more common. As to spontaneous labor, in the cases he had seen it had occurred in sixty or seventy per cent of them.

Dr. John O. Polak, of Brooklyn, said that his results from premature labor had been unsatisfactory. The fœtal mortality had been considerable, and it had subjected his patients to the possibilities of infection. He and his associate had done Cæsarean section in sixty-one cases without a death, and many of these patients were handled and brought in off of the ambulance after several attempts at delivery with forceps had been made. He had had no difficulty in delivering these women, and he had had no marked morbidity, and no mortality.

Dr. Robert L. Dickinson, of Brooklyn, said there was a large field for the induction of labor. He did not allow primiparæ to run overtime unless they had been well starved. Starvation and early delivery had given him successful results so far as the fœtal death rate was concerned.

Dr. Edward P. Davis, of Philadelphia, said, with reference to Cæsarean section, when a woman had had a test of labor and had a contracted

pelvis, one need not necessarily wait for labor, but he should resort to Cæsarean section and in clean cases he would get good results.

SALPINGOSTOMY IN PREGNANCY

Dr. George Gellhorn, of St. Louis, read a paper on this subject which appears in this issue of Surgery, Gynecology and Obstetrics. His conclusions were: 1. Salpingostomy was indicated in (a) where children were desired. (b) If the occluded tube contained no infectious matter, and (c) if the tubal mucosa seemed intact or still capable of reparation. 2. While its field was rather limited, salpingostomy had been followed by pregnancy in a few cases. 3. With proper selection of cases and by appropriate after treatment the end results would become more promising. 4. Salpingostomy in itself added no danger to the patient.

DISCUSSION

Dr. Thomas J. Watkins, of Chicago, said he had recently been interested in the technique of salpingostomy, having had trouble in making an artificial opening in the tube to avoid constricting it. Even in cases where the incision was made parallel, where the mucous membrane was turned over into the serosa and stitched, after the operation was completed the opening was surprisingly and disappointingly small. Of late he had modified the technique which would seem to be a great advantage, namely, making a longitudinal incision, beginning at the distal end of the tube and suturing the mucous membrane on either side of the ovary, and in that way offering hope of not constricting the tube and of its not becoming occluded.

Dr. Franklin H. Martin, of Chicago, stated that for three or four years, instead of doing salpingostomy in these slightly sacculated cases, he had been in the habit of employing a method of opening the tubes and rendering them patulous by means of hydrostatic pressure. Any tube that would hold from ten minims to half an ounce of fluid should be treated in this way. The tube was brought to the surface, and, after being liberated from adhesions, was placed upon a thick laparotomy gauze sponge, and then the tube was milked in the direction of the fimbriated end. Almost every one of these tubes would rupture at the fimbriated end, opening up the tube along the fimbria, and at the same time causing evacuation of the tube.

Dr. J. Wesley Bovee, of Washington, D. C., had done several salpingostomies. He had had one case of pregnancy, and this was ectopic.

Dr. Robert L. Dickinson, of Brooklyn, said that he had spread the tube on the ovary in sixteen or eighteen cases and dropped it.

SALPINGITIS

Dr. Frank T. Andrews, of Chicago, read a paper on this subject, which is published in this number. (See p. 14.)

DISCUSSION

Dr. Seth C. Gordon, of Portland, Maine, said that pyosalpinx was very much more common years and years ago than it was now. In the early days of gynecology in America almost every practitioner wrapped a probe with cotton and dipped it in some solution and passed it around the uterus. He found a number of cases of pyosalpinx in those days. Occasionally he found it following an abortion, when the tube would become very large and adherent to the vault of the vagina. He operated upon most of these cases through the vagina, making a free incision and establishing drainage and nearly all those patients got well.

Dr. Edward Reynolds, of Boston, said that in many cases of chronic vaginal discharge, as soon as the tubes were dealt with, the vaginal discharge decreased. This was certainly very true in his experience. He was inclined to believe it was due to the probability that in chronic salpingitis there was a passage downward of small quantities of discharge or of a ferment, which, on emerging into the uterus or vagina, kept up a much more profuse discharge in the larger passages, the tubes acting as reservoirs for the ferment and that increasing the vaginitis, and after its removal the tubes were clear. It was difficult for him to see how we could expect any very large percentage of cures in these chronic cases of salpingitis by vaccination, when one remembered the physical state in which most of these tubes were left.

Dr. Thomas J. Watkins, of Chicago, said that Dr. Andrews' paper was along the line of developing immunity, and he had said that a patient did not get well because the local disease got better, but the local disease got better because the patient developed a general immunity. And this had been the idea in the treatment of pelvic infections. Now, the gynecologist did everything he could to develop immunity. He had found that if he drained a pus tube or took it out in the most surgical manner, without spilling the pus, the patient's temperature was not shortened. The patient ran a fever for two or three weeks, probably a little longer with an operation than without it, because the amount of bacteria and

poison removed by the operation was less than the amount of physiological resistance cut down as the result of the operation. So in these cases the surgeon had very much to be thankful for this contest between physiological resistance and bacterial invasion.

DOUBLE OVARIAN DERMOIDS IN PREGNANCY

DR. WALTER P. MANTON, of Detroit, Michigan, contributed a paper on this subject, which will appear in this journal.

DISCUSSION

DR. GEORGE GELLHORN, of St. Louis, said as to the relation of dermoids to pregnancy, he knew of an interesting case which occurred in the practice of a professional friend, Dr. Ehrenfest, which he would like to relate briefly. A young married woman during her first pregnancy had to be examined, and the presence of a tumor was determined. Laparotomy was performed during the fourth month of pregnancy, and a cyst removed, which was found to be a dermoid. On the other side there was a smaller cyst of exactly the same nature. But as experience had taught that the removal of both ovaries during pregnancy threatened to terminate pregnancy, the second smaller ovarian dermoid was left behind. It was rather important for the family desired more children, and so the second ovary was not removed. The first pregnancy terminated normally, but the woman was kept under constant observation. This woman had borne a second child since, and was now being watched closely to see if she might possibly have a third child, after which the dermoid cyst would be removed to prevent the possibility of carcinomatous degeneration.

DR. THOMAS J. WATKINS, of Chicago, said that with a double dermoid it would seem very feasible to simply leave a part of the tumor which contained the corpus luteum, and this probably would prevent the interruption of pregnancy. He was making some experiments along this line, but they were not far enough advanced to come to a conclusion.

DR. BROOKS H. WELLS, of New York, stated that the removal of these ovaries during pregnancy did not interrupt pregnancy. He recalled a case in which there were two dermoid cysts of both ovaries, which were removed, the patient being advanced four months in pregnancy and went on to term.

DR. MANTON (closing) stated that in all of these cases he personally had never had a case on which he had operated on both sides during pregnancy, removing the dermoids. In all reported cases, where the dermoid was on one or both sides, pregnancy had gone on uninterrupted. The majority of operators advocated leaving behind a portion of an ovary.

SOME ADVANCES IN OBSTETRICS DURING THE LAST TWENTY-FIVE YEARS

DR. A. LAPTHORN SMITH, of Montreal, stated that if one were to ask any practitioner with a large obstetric practice what had been the greatest advance in that department of medicine during the last twenty-five years he would reply without hesitation, asepsis and the abolition of puerperal fever. Every doctor and every nurse felt that it was now a personal disgrace to have a case of puerperal sepsis on their hands, and yet he was convinced that in many of the cases he had been called to they had been absolutely blameless.

Dr. Smith then discussed inversion of the uterus, the abandonment of ergot, injuries to the soft parts, the use of forceps, the preliminary placing of the perineal stitch, the repair of old lacerations of the cervix and perineum at the next confinement, pelvimetry, delivery by Cæsarean section, Cæsarean section for ventrofixation, puerperal convulsions and the toxæmias of pregnancy, vomiting of pregnancy, spinal and other anæsthesia, the use of anæsthetics for the second stage of labor, and lastly, the trained nurse in obstetrics.

THE BLOOD SUPPLY OF UTERINE MYOMATA

DR. JOHN A. SAMPSON, of Albany, New York, stated that in his paper he presented observations from a study of eight injected uteri containing myomata. He spoke of the methods of study, arterial and venous injections, and presented photographs and enlargements, saying that the latter would show details that were not readily seen in the enlarged photographs, and he also spoke of the use of salts impervious to the X-ray, radiographs and stereoscopic radiographs, etc. By means of stereoscopic radiographs of serial sections of any specimen, in which either the arteries or veins were filled with a substance impervious to these rays, it was possible to follow the entire course of each vessel so injected.

The blood supply of the normal uterus, the main intrinsic uterine arteries, to which the name arcling might be given, penetrated the anterior and posterior uterine walls and lay between the outer and middle third. Their course was hori-

zontal in the lower portion of the body of the uterus and obliquely horizontal (upward) as one approached the fundus. Each arcling artery terminated in a medial, radial or centripetal branch, and peripheral branch, the latter often anastomosing with a similar branch of the opposite arcling artery, thus establishing a communication between the two main arteries. All along the course of each arcling artery, radial branches arose which terminated in the endometrium, and also peripheral branches arose which nourished the myometrium.

Sections of injected uteri containing myomata showed that all tumors of an appreciable size had an arterial blood supply which varied greatly in different specimens and in larger tumors was frequently greater than that of the myometrium. These same sections failed to demonstrate any vein in many of the tumors; in others a few small veins might be seen throughout the tumor or about its periphery, while occasionally they were quite evident, but never as abundant as in the myometrium.

The extrinsic and intrinsic arterial supply of these tumors explained many of their clinical phenomena, such as the slow growth of some, the rapid growth of others, especially during pregnancy, and likewise their frequent decrease in size after labor and the menopause. He could readily understand why these tumors may be shelled out from the uterine wall with slight bleeding which occurred only in a few places. Tumors in which veins were found in their substance and about the periphery suggested that the change between arterial and venous blood occurred within the tumor; in those in which the veins were not found it was impossible to demonstrate where this took place.

The regressive changes in these tumors, calcareous deposits, and necroses were in many instances due to alterations in the vascularity of the tumor as a whole or a portion of it.

ANATOMICAL STUDY OF THE OVARY

Dr. John G. Clark, of Philadelphia, gave a talk on the anatomical study of the ovary, which was illustrated with numerous lantern slides. He referred to the development of the ovary from the Wolffian body. The differentiation of sex was early determined by the radical differences in the blood supply to the primitive ovary and testicle. Upon the ovarian vascular distribution apparently depended the proper development and maturation of the Graafian follicle. He traced the successive stages of development of the ovary from infancy to old age. The corpus luteum was of the greatest importance, and nature had devised a very comprehensive vascular scheme for its development and retrogression. Upon the maintenance of the vascular system of the ovary apparently depended the perpetuation of the menstrual life of the individual.

THE FUNCTION OF THE OVARY

Dr. Robert T. Frank, of New York City, read a paper on this subject. The paper appears in this issue. (See p. 36.)

IS THERE ANY CLINICAL OR EXPERIMENTAL PROOF THAT THE OVARY HAS AN INTERNAL SECRETION?

Dr. W. H. Morley, of Detroit, Michigan, contributed a paper on this subject, which is published in this number. (See p. 28.)

CONSERVATION OF THE OVARY

Dr. W. W. Chipman, of Montreal, read a paper on this subject, which appears in this journal. (See p. 63.)

BEHAVIOR OF THE OVARY AFTER THE REMOVAL OF THE UTERUS

Dr. Robert L. Dickinson, of Brooklyn, New York, stated that conservation of ovarian structure after hysterectomy showed four-fifths of the patients free from disturbances of the surgical menopause. The results were somewhat better where both ovaries remained than where one was left or where resections were done. Where the disturbances had occurred their character was less severe and more gradual than after bilateral removal of the ovaries. In married women the conservation showed nearly uniform persistence of sexual desire. The practice of removing ovaries when taking out a uterus at or near the time of the menopause was strongly opposed, except in cases of malignant disease or when infected. Conservation after operations for incurable tubal infections left more tender and troublesome ovaries than after hysterectomies for fibroids, prolapse, or the hæmorrhage of chronic metritis. After removal of the uterus, particularly of one ovary, or a large fibroid, ovarian edema or hypertrophy was frequent. The menopause was likely to occur earlier than the average time in a woman who had lost her uterus. To preserve the functional activity of the ovary, its circulation must not be impaired. Removal of the tubes frequently comprised the ovarian blood supply, and was a delicate and unnecessary adjustment. Barring disease and closed tubes and malignancy and tuberculosis, they should be disregarded and allowed to remain. In forty

cases in which both or one remained behind, he could not see that any harm had resulted.

THE END RESULTS WHEN HYSTERECTOMY HAS BEEN DONE AND AN OVARY LEFT

DR. JOHN O. POLAK, of Brooklyn, read a paper with this title, which is published in this journal. (See p. 24.)

OVARIAN TRANSPLANTATION IN LOWER ANIMALS; REVIEW OF THE LITERATURE

DR. FRANKLIN H. MARTIN, of Chicago, read a paper on this subject, which appears in this number. (See p. 53.)

DISCUSSION ON THE SYMPOSIUM ON THE OVARY

DR. SETH C. GORDON, of Portland, Maine, said that in years past he performed a good many operations for the removal of the ovaries, and he had not regretted it. He had seen a great many women relieved by the removal of both ovaries. When they removed the ovaries, it was bad surgery to leave the uterus. He believed that when they were obliged to remove both ovaries they should always remove the uterus along with them. He did not know of any condition by which they could justify themselves in leaving the uterus after the ovaries were removed.

DR. A. LAPTHORN SMITH, of Montreal, stated that the unfortunate part of his professional experience had been so-called conservative gynecology. He was a happy operator before he began conservative work on the ovaries. Since he had been trying to save the part of an ovary he had had nothing but trouble. He believed in removing diseased ovaries and not trying to save parts of them.

DR. W. GILL WYLIE, of New York, stated that what was done to-day was a great improvement on the past, and he would accept most of what had been said by the authors of these papers; still the experience of some of them who were older in the profession had had a bad effect in one way and a good effect in another; that was in the days when Battey proposed the removal of normal ovaries for dysmenorrhœa, hæmorrhage, and other conditions, they were even then cured. In those days he removed the ovaries for reflex troubles in some cases, but in very few. The reason he did not do more of these operations was because he had found imperfect development had a great deal to do with the ovary, and that a faulty development of the ovaries had much to do with the growth and development of the woman, not only as to how she menstruated, but as to the local condition and the effect on her growth.

DR. WALTER P. MANTON, of Detroit, Michigan, stated that he was the first in the Middle West, he believed, to take up the conservative treatment of ovaries. Years ago he published a list of one hundred cases on which he had operated in a conservative manner and followed them carefully, and he found in that number a little over 94.6 per cent of somatic cures and 5.6 per cent of the women afterwards became pregnant. Since that time he had continued this conservative work satisfactorily, and the somatic cures had remained about the same.

DR. EDWARD REYNOLDS, of Boston, said he had been working along the lines of conservatism in the treatment of the ovaries for a good many years, and he found that the conservative management of these cases, and the institution of operation for the correction of minor pathological conditions in the ovaries had grown upon him steadily, so that to-day he believed it was practically never necessary to remove all the ovarian tissue from a woman of child-bearing age except in cases of malignancy, or tubo-ovarian abscess, or extreme inflammatory disease.

DR. J. M. BALDY, of Philadelphia, said with reference to the internal secretion of the ovary, until absolute and unmistakable proof was furnished along this line, he did not propose to base his surgical methods and the health of his patients on any such nonsense.

DR. GEORGE GELLHORN, of St. Louis, stated that he had used ovarian extract for a number of years, and frequently in patients who had reached the menopause, both natural and artificial, and his results had not been uniform, nor were they convincing. In the menstrual disorders of puberty the results had been a trifle better but not constant.

DR. THOMAS J. WATKINS, of Chicago, said he could see no logical reason for removing a normal ovary, but he could see much logical reasoning for leaving parts of diseased ovaries, especially in young women. He had left parts of suppurating ovaries, and he had never left part of a suppurating ovary that had given any trouble afterwards, the sac of the abscessed ovary being very thoroughly excised.

DR. I. S. STONE, of Washington, D. C., stated that there was cause occasionally for leaving the uterus after the removal of the ovaries. The uterus was left frequently for the purpose of repair of intestinal injuries. It ought to be and can be used in that way. He knew of nothing in his surgical work with reference to the saving of human life which had given him more satisfaction than conservative surgery upon the ovaries.

Dr. Joseph Brettauer, of New York, stated that he had had a good deal of experience with the administration of ovarian extract which came from the market, with practically no results in hundreds of cases. He had had most gratifying results in fighting the disagreeable symptoms accompanying the climacteric with very small doses of thyroid which surely was not derived from the ovary. As to conservative surgery, he was extremely loath to open the abdomen, but when he did open it, he was very rarely conservative.

Dr. Frank T. Andrews, of Chicago, stated that for some time he had held to a theory something like this with regard to the matter of internal secretion of the ovary, that every rupture of the follicle consisted of a spontaneous inoculation of the patient; that every rupture of a follicle was followed by a small amount of inflammation within the pelvic cavity, and that there was a sort of response on the part of the tissues of the patient. If the spermatozoa passing into the ova exerted an influence on the female, and they got future development and maturation of the ovum, that furnished to the female the one thing which was needed to make a great many changes in the body. It furnished the ambocepter and allowed the working of Ehrlich's side-chain theory, and therefore, they had not an internal secretion, but a doubleheaded internal secretion, a combination of substances that brought about all changes in the site of attachment of the ovum in the uterus. The changes in the ovary led to the changes in the corpus luteum, changes in the breast, and general physique of the patient.

Dr. Lewis S. McMurtry, of Louisville, stated that he was sure every man present, when at the operating table, would deal with ovarian disease in practically the same way. Some of the speakers had discussed inflammatory disease. They had alluded to adhesions, and they were going to deal radically with all those cases in which there were longstanding acute infections, and they were going to remove infection and remove useless organs. Others had been talking about moderate degrees of cystic degeneration, which was an entirely different subject both from a pathological and surgical standpoint, so that he was satisfied that those who had spoken would all do practically the same thing.

Dr. J. Whitridge Williams, of Baltimore, said in connection with the corpus luteum, when associated with the condition of hydatidiform mole, they frequently had tumors arising from the corpus luteum of very large size. They got double cystomata of the ovary, multilocular cystomata of the size of his two hands developing on either side. These cystomata were made up of cysts, of varying size, many of them reaching an inch and a half in diameter, lined by lutein cells. Whether they were the cause of the hydatidiform mole, or whether the hydatidiform mole brought about their production, he was not prepared to state, but an interesting point was this; recent observation showed that many of these cases, if followed for a reasonable time, after extrusion of the mole, underwent absorption, and there were a number of cases where tumors larger than a cyst had disappeared within six months after extrusion of the mole.

Dr. J. M. Munro Kerr, of Glasgow, Scotland, stated that they were all agreed that there were certain cases in which the ovary should be conserved. On the other hand, in cases of malignant disease of the uterus, and suppurative conditions of the adnexa, it would not be considered good surgery to conserve ovaries. In such cases the uterus, tubes, and ovaries should be completely extirpated.

Dr. Robert T. Frank (closing the discussion:

I not only believe, but I *know*, that the corpus luteum has an internal secretion. Yet I can well understand and even sympathize with the agnostic standpoint of Doctors Baldy, Brettauer, and Kerr. Furthermore, I believe, that in the long run less harm will accrue to patients if clinicians adhere to the extreme conservatism of these gentlemen, rather than accept without critique every newly published experiment, and change their clinical methods, to conform with each new hypothesis.

In my paper I purposely refrained from making practical application of the experimental data to human physiology and to gynecology. In view of some of the points which have been raised in the discussion, and of some of the questions asked, I shall point out what conclusions we might be justified in accepting, at least tentatively.

My presentation was necessarily incomplete, as the field was too huge to allow of the consideration of all details. I dealt with only such facts as were needed to build up a complete and consecutive chain of proof, and I particularly tried to emphasize the function of the *separate and individual* components of the ovary.

I took for granted that you would keep in mind not only the local effect exerted by the ovaries upon the female generative organs, with which I dealt exclusively, but also the systemic influence upon the secondary sexual characters (distribution of hair and of subcutaneous fat, development

of the pelvis and larynx, etc.), and the possible effect upon the body metabolism.

When discussing the effects of castration it is necessary to remember that the symptoms will differ according to the age of the patient. Castration in early youth causes persistence of the infantile or neuter type; castration after puberty brings about the symptoms of the artificial or postoperative menopause; castration after the natural menopause usually produces no symptoms.

We need only consider the second group; castration during the active sexual period, which is followed by the artificial menopause. Here the symptoms may be threefold,— first local, upon the generative organs, second general, upon the nervous system, and perhaps third upon the body metabolism.

The effect upon the generative organs is well understood and readily recognized; the nervous manifestations are protean, variable, and influenced by the subjective feelings of the patient; and the general metabolic changes are not yet satisfactorily determined. McCrudden, who has performed the most recent and complete series of experiments found, that, in both adult male and female dogs, castration produced no change in the metabolism of energy.

Those experimental and clinical investigators who claim that ovarian or lutein medication is efficacious have always used either the nervous symptoms or the metabolic effects as indices, and have persistently neglected to employ the only reliable index—the generative organs—as controls. Those workers who have used the uterus as the means of determining whether ovotherapy is of value have unanimously reported that ovarian extract or substance is inert.

Now permit me to explain to you, as well as the short time at my disposal will allow, *what a truly active lutein substance should be expected to do.* Again we must distinguish sharply between the effect on non-castrates and upon castrates.

In non-castrates an *active* lutein substance should suppress maturation of follicles and *inhibit* menstruation as long as the drug is exhibited. The uterine mucous membrane ought to remain at the postmenstrual stage and ought to respond to mechanical stimuli by the formation of deciduomata. The ovaries should be found distended with many degenerating cystic follicles.

In castrates the uterine findings should be the same as in the previous group, and such atrophic changes as are invariably noted in the vulva, vagina, and cervix should be conspicuous by their absence.

Perhaps ovarian extract may prove to be like adrenalin; that it represents only one, and that the least vital, of the natural secretions of the gland from which it is derived. Those who believe in ovotherapy have not yet even proved such a limited effect. Nevertheless some of the claims would accord to it a value similar to that of thyroid extract, which is able to replace the complete absence of the thyroid gland.

Dr. Reynolds mentioned that in cases of sterility, in which he, for one reason or another, had had occasion to explore the ovaries, he not infrequently found a persistent corpus luteum with cystic dilatation of numerous follicles. When he shelled out the corpus luteum and punctured the cysts, these patients were relieved of their symptoms and some later became fertile. These findings correspond to the ones I mentioned in cows with persistent corpora lutea. Personally I do not know by what criteria a persistent corpus luteum in the human ovary can be recognized.

Dr. Gellhorn stated that the fault with our present ovotherapy might lie in the method of giving it by mouth. I have used it subcutaneously and intraperitoneally, in animals, without result. The intravenous route is impracticable because coagulation is produced.

Dr. Watkins inquired whether, according to our present standards, any difference was recognized between the so-called corpus luteum spurium and the corpus luteum of pregnancy. I should say there was no distinction fundamentally, but that in the latter case, some as yet unknown stimulus prolonged the continuance of the yellow body. He further instanced a case in which a corpus luteum was removed and menstruation returned earlier than before. This is in accord with experimental findings.

Dr. Brettauer and Dr. Williams both put themselves on record as adhering to the view that the origin of the corpus luteum is from connective tissue. Many investigators agree with them. I have no further proof to offer than that presented to you in my paper. Very possibly a considerable part of the bulk of the corpus luteum is derived from mesodermal derivatives, and thus favors their view, which is based upon morphology. The physiological facts, which I have previously discussed at some length, do not admit of such interpretation; on the contrary they oblige us to consider the *active* portion of the gland of epithelial origin, in conformity with all the other glands of external or internal secretion.

A CONSIDERATION OF VAGINAL CÆSAREAN SECTION IN THE TREATMENT OF ECLAMPSIA BASED UPON A STUDY OF 530 PUBLISHED AND UNPUBLISHED CASES

DR. REUBEN PETERSON, of Ann Arbor, Michigan, selected this title for his presidential address.

He said the treatment of eclampsia was difficult because the actual cause of the disease was still unknown. No one theory as to the etiology of this complication had proved entirely satisfactory.

1. As to the maternal mortality resulting from 530 cases of vaginal Cæsarean section for eclampsia, of this number of patients with eclampsia operated upon by vaginal Cæsarean section, 124 died, or a mortality of 23.4 per cent. This seemed a high percentage when compared with the results of certain operators with this same operation for eclampsia. But it must be remembered that no attempt had been made to prepare a brief for the operation. The mortality stood as the result of the work of more than 100 operators, where individual experience with the technique of the operation could not have been great. Veit had a mortality of 11.9 per cent out of 42 cases. Winter had had a still lower mortality with this operation for eclampsia, losing only 3 patients out of 34, or a mortality of 8.8 per cent. Seitz in his admirable statistical paper on eclampsia had shown that after spontaneous delivery the mortality was about 20 per cent.

Perhaps the most striking figures were those of Fromme from Veit's clinic. He collected 100 cases of eclampsia occurring seven and a half years prior to 1910. All of these patients were delivered immediately after entering the clinic, 58 prior to and 42 after the advent of labor. Vaginal Cæsarean section was performed upon 55 of the 58 patients with a mortality of 12 per cent. The total mortality of prompt delivery in the 100 cases was only 9 per cent. There was a series of 34 cases where delivery was effected after not more than two convulsions without a single death.

The high mortality in the author's series of cases was undoubtedly due to delay in operating, probably because the patients were not brought to the hospital early enough after the onset of the convulsions. This statement was borne out by a study of the results of the vaginal Cæsarean sections performed immediately after the first few convulsive seizures.

2. The effect of emptying the uterus upon the cessation of the convulsions. In 453 cases in the author's series, all of them being cases of operative delivery, the convulsions ceased in 282 or 62.6 per cent. In 2,135 cases of eclampsia, collected by 12 observers, convulsions ceased in 57.7 per cent. In 247 cases of spontaneous delivery in eclampsia convulsions ceased in 59.5 per cent, and in 994 cases after operative delivery the percentage was the same. Therefore, it may be concluded that: 1. Convulsions cease after delivery in eclampsia in a little more than one-half the cases. 2. It apparently makes very little difference as regards the cessation of the convulsions whether the delivery ends spontaneously or is terminated by operative means. 3. The extent to which the maternal mortality in eclampsia is affected by the cessation of the convulsions after delivery.

Too much importance was often placed upon the cessation of the convulsions after delivery. Such cessation did not necessarily mean the patient would recover. The mortality in the author's series where the convulsions ceased was 17.6 per cent. Seitz and Duhrssen's mortalities in similar cases were 20.6 per cent and 26.1 per cent respectively. The mortality was much higher where the convulsions continued after delivery.

From this study it might be concluded: 1. The fact that convulsions ceased after delivery does not mean that the patient will recover. 2. On the contrary, under these conditions about 18 per cent die. 3. The mortality where convulsions continue after delivery is about 10 per cent higher than where they cease after labor. Therefore, the patient with no convulsions after labor stands a much better chance for recovery.

1. The author stated that the maternal mortality in eclampsia after vaginal Cæsarean section increased with the increase in number of convulsions preceding the operation. 2. Up to ten convulsions there is no particular regularity to the mortality of eclampsia when the uterus was emptied by vaginal Cæsarean section. 3. However, beginning with the operation performed after ten convulsions the mortality rapidly increased until it reached a high figure.

As to the maternal mortality in relation to postpartum convulsions, from a study of his cases it had been found that the maternal mortality increased with the increase in the number of convulsions. There were a number of individual exceptions to the rule that patients with a great number of convulsions died. Out of the five cases with from 30 to 65 convulsions there was only one death. One patient recovered after 50 postpartum convulsions.

An exceedingly interesting study was the frequency of twin pregnancies in his list of 530 cases

of eclampsia. They occurred once in 31 cases, while the normal ratio according to Veit's statistics based upon 13,000 cases of labors was once in 89 cases. This showed that in the author's series of cases, twins were nearly three times as frequent as in normal cases. It would also support the contention that multiple pregnancy was one of the contributory causes of eclampsia. In eclampsia based upon 2,282 cases, twins occurred once in every 19 cases and triplets once in every 760 cases of eclampsia instead of once in about 8,000 cases of labor.

It might be concluded from a study of this portion of the subject that: 1. The number of convulsions where the patients died was higher than where they recovered. 2. Multiple pregnancies were much more common among eclamptics. Twins were four and a half and triplets ten and a half times more frequent in this complication. Therefore, multiple pregnancies probably acted as a contributory cause of eclampsia. 3. The fœtal mortality in eclampsia.

In any discussion of the treatment of eclampsia remarks were almost entirely confined to the maternal mortality. In the presence of the grave danger to the life of the mother, the life of the fœtus had not been held expecially sacred. However, there had been a gradual change of sentiment in this regard. Now, any new treatment for eclampsia must demonstrate that its results were equally good for the child before it would be sanctioned for the mother. Obviously it was unfair in the estimation of the value for the fœtus of any form of treatment in eclampsia to include cases where the period of gestation was so early as to preclude any hope that the child might live after artificial or spontaneous delivery.

The eclamptic convulsions were an index to the degree of maternal intoxication. That the fœtus as well as the mother suffered from the poisoning had been established beyond doubt clinically and by postmortem examinations. Convulsions not infrequently occurred shortly after birth in children born of eclamptic mothers and characteristic lesions had been demonstrated in such children.

Eclampsia was more common in primiparæ than in multiparæ. This was shown where in 3,134 cases of eclampsia the percentage of primiparæ was 75 and the multiparæ 24. The preponderance of primiparæ might be explained possibly on the grounds of pressure changes, more prominent in primigravidæ. Eclampsia was nearly three and a half times more common in primiparæ than in multiparæ. The mortality in multiparæ with eclampsia was decidedly higher than in primiparæ, 28 per cent in the former, and 22 per cent in the latter. The fœtal mortality was higher in multiparæ, although relatively not so high as the maternal mortality.

The age of the youngest patient in the author's series was 16, that of the oldest 44. Setting aside the high mortality between the ages of 25 and 30, the maternal mortality curve rose gradually, the mortality in the age between 41 and 44 being 28.5 per cent.

In the author's series there was no case of eclampsia below the 9th month of gestation and the number of cases increased from that period to term.

As to operative procedures employed prior to the vaginal Cæsarean sections, if the author's results up to this point had shown anything, it was that the sooner the uterus was emptied after the onset of the eclamptic convulsions, the better would be the mortality for both mother and child. Conversely the greater the delay, the higher would be the maternal and fœtal mortalities.

Apparently the anterior incision had proved satisfactory for the majority of operators, since it was employed in two-thirds of the cases. The fœtal mortality was decidedly higher after the anterior incision than after both incisions. Hence it may be concluded (1) that the fœtal mortality after vaginal Cæsarean section was decidedly lower where the anterior uterine wall alone was incised. (2) Since this was also true during the ninth and tenth months of pregnancy, when the extraction of the fœtus presented the greatest difficulties, we were justified in concluding that the anterior incision ordinarily served all purposes and that the additional posterior incision could be dispensed with.

After discussing the difficulties of the operation, the author drew the following general conclusions: 1. The maternal and fœtal mortalities were lower, the earlier the uterus was emptied after the first convulsion in antepartum eclampsia. 2. Hence no time should be lost in employing the slower methods, but as soon as the diagnosis of eclampsia was established, the uterus should be emptied by the operation which will give the best results for mother and child. 3. Vaginal Cæsarean section meant these requirements because it was based upon sound surgical principles, was quickly performed, while its technique could be acquired by any one familiar with the rudiments of obstetric surgery. 4. Early diagnosis and early operation in antepartum eclampsia would lead to a marked reduction in both the maternal and fœtal mortalities.

DYSMENORRHŒA RELIEVED BY NASAL TREATMENT

Dr. Joseph Brettauer, of New York, in his paper called attention to a monograph published in 1897 by Dr. Wilhelm Fliess in which he claimed that certain spots in the nasal mucous membrane, the tuberculum of the septum, and the anterior half of the lower turbinate had a direct connection by way of the sympathetic system with the genital organs. During menstruation these circumscribed areas were invariably swollen, more prominent, hyperæsthetic, and bled easily upon the slightest touch, all of which symptoms disappeared after cessation of the menstrual period.

In cases of severe dysmenorrhœa, the symptoms —nausea, vomiting and pain in the iliac regions— had immediately disappeared upon the application of a twenty per cent solution of cocain to the genital spots. Whenever such prompt relief was obtained, permanent relief was often secured by cauterization of the genital spots during the menstrual interval, with trichloracetic acid, the galvanc-cautery or bipolar electrolysis and by attention to any pathological condition found in the nose. The accuracy of these claims had been substantiated at several clinics and they had been endorsed by Schiff and others. He had had remarkable results in several instances by this treatment; and in his paper he cited the histories of five cases in detail.

THE PELVIC KIDNEY

Dr. J. Dougal Bissell, of New York, presented a further contribution to the study of pelvic kidneys and their replacement, and reported two new cases.

ANTEFLEXION OF THE CERVIX AND SPASM OF THE UTERINE LIGAMENTS IN RELATION TO RETROVERSION, DYSMENORRHŒA, AND STERILITY

Dr. Edward Reynolds, of Boston, read a paper on this subject which appears in the present issue of this journal. (See p. 17.)

EXHIBITION OF SPECIMENS

Dr. Philander A. Harris, of Paterson, New Jersey, exhibited numerous specimens of gall-stones and gall-bladders, and made some remarks on the subject of gall-stones.

EPILEPSY AND PREGNANCY

Dr. G. Brown Miller, of Washington, D. C., stated that epilepsy had little direct influence upon the course of a pregnancy, except that traumatism produced by epileptic seizures might cause a premature labor and abortion. The influence of pregnancy upon epilepsy was of greater interest. In a certain proportion of cases the toxæmias of pregnancy might influence very unfavorably the epilepsy even to producing the status epilepticus. The difficulty in making a diagnosis between the status epilepticus and the eclampsia was great, but the proper diagnosis was necessary, as the treatment was radically different. He reported a case of probable status epilepticus, discussed it, and reported a few similar cases from the literature.

From a careful study of his own case and the literature, the following conclusions would seem to be warranted: 1. In women with epilepsy where pregnancy apparently caused the convulsions to become more frequent or more severe, one should always consider the necessity of terminating the pregnancy. 2. In cases of pregnancy in epileptic women, one should watch with extreme care for indications of toxæmia or the premonitory signs of eclampsia, and should put an end to pregnancy at the appearance of symptoms of much less gravity than would indicate this procedure in women who were not the subject of disease.

REPEATED ECTOPIC PREGNANCY, WITH A REPORT OF FOUR CASES

Dr. Richard R. Smith, of Grand Rapids, Michigan, reported four cases in which a second tubal pregnancy followed a first. In two the interval was about two years; in the others but one; in two of these women these pregnancies constituted the only ones, the other two having previously borne children. He had found about 170 similar cases in the literature, to which he added these, and a number of others obtained through correspondence. In a total of 2,998 cases, there had been 114 recurrences, or about 3.8 per cent. He pointed out the difficulty of following up hospital cases over a period of years to know of their welfare and the fact that age, social condition, and lapse of time since operation were not taken into consideration in these figures. He believed the percentage would be higher in cases where a patulous tube was left and social conditions were favorable to pregnancy. These cases of repeated ectopic had occurred, as might be expected, in the child-bearing age and in the decades in which normal pregnancies were most prevalent. There was a high death rate following the second ectopic, but later reports seemed more favorable and apparently not higher than that following a single ectopic. In 116 cases of second ectopic, there were 101 recoveries, and 15 deaths with or without operation. The average length of the interval was about thirty months

but no rule could be formulated as to when a second ectopic may be expected. A considerable number occurred in less than six months. Baldy reported one occurring twelve years after the first. The percentage of interval pregnancies was small; most of the recurrences took place in the opposite tube, but a number were reported as recurring in the same one, also several ovarian pregnancies (doubtful), and an abdominal followed by a tubal. Several instances of three ectopics occurring in the same women were reported.

He had been unable to obtain exact data in any considerable number of cases as to further normal pregnancies following an ectopic, but believed them to be less frequent than ordinarily assumed. He gave as his opinion that the matter of the disposal of the other tube should be discussed with the patient before operation whenever practicable. In young women and those desiring children the opposite tube might be saved; in those who had already borne as many as desired, it should be sacrificed rather than submit the woman to the distressing possibilities of a second accident. The appearance of a tube when patulous was no criterion as to its capabilities.

DISCUSSION

Dr. Henry D. Fry, of Washington, D. C., said there was one important line of investigation which Dr. Smith did not bring out, and that was whether the cases were all of the intraligamentous variety and whether the operation was done through the vagina or abdomen. If we operated from below, we would leave a crippled tube. That tube might regain its function, and the woman might become normally pregnant through the tube again, but it was more likely that cases operated through the vagina would yield a second ectopic gestation. In his reply to Dr. Smith's letter he said he mentioned several cases, and one if them was a patient whom he saw in consultation with Dr. Summey, of Washington. If he remembered correctly, this woman had not had any children, but she did have one ectopic gestation in the left side which necessitated an abdominal operation, and the tube was removed. He saw her with a second ectopic gestation, and it was in the other side; there was an intraligamentous rupture, and he operated through the vagina. That woman still had a crippled diseased tube in there, which might be the point of another ectopic gestation.

Dr. J. Wesley Bovee, of Washington, D. C., said with reference to the probability of pregnancy supervening on ectopic cases, he merely wished to call attention to a case he reported eight or ten years ago of a full term abdominal pregnancy which the woman carried for nine years. This woman was living on an old plantation in Wakefield, Westmoreland county, Virginia, and when he operated on her he removed the skeleton of this full term pregnancy. She had a child three years of age, showing that she had become pregnant and had carried the child to normal termination.

There was one other point he desired to mention, and that was an ethical matter, namely, the prevention of future pregnancy. He did not think in the light of statistics or of operations for ectopic pregnancy we had a right to take away from a woman the possibility of conception by removing the opposite tube because of her having become pregnant on one tube. He thought the woman had a right to become pregnant, and the decision whether to take that chance should remain with the patient.

Dr. A. Lapthorn Smith, of Montreal, took an opposite view to that enunciated by Dr. Bovee, and said he knew of two women upon whom he had operated a second time, and they reproached him for making such a second operation possible. It was his practice to remove both tubes and ovaries in all cases; then he got those cases when he began leaving the tube, and had two recurrences.

Dr. John O. Polak, of Brooklyn, said the ovaries in these ectopic cases, although they seemed involved in a subacute process, could be isolated and looked like very good ovaries when the tubes were separated from them, and he seldom had to remove an ovary in an ectopic case.

In regard to whether we should take out the other tube or not, which was the real question Dr. Smith had brought out in his paper, it depended on certain factors. One was, what was the cause of the ectopic pregnancy? The rule he had followed, which might be of some value to others, and he spoke of it simply as an individual expression of opinion, was that one ectopic occurred after a long period of sterility in a woman who had never borne a child, and the ectopic had been the result of a long period of married life, and he took it for granted that the tube on the other side was congenitally deformed, and in those cases he had removed the other tube. He had also removed the other tube in cases where the women had a long period of sterility following a definite attack of pelvic inflammation.

Dr. Seth C. Gordon, of Portland, Maine, said that his first operation for ectopic pregnancy was the second successful one in this country.

Thomas wrote him at the time and congratulated him on saving the patient. It seemed to him that the tube in an ectopic pregnancy was quite a different tube from the ordinary tube which one would extirpate, and so he would differ with Dr. Smith in this matter. Whenever these tubes were found slightly inflamed before ectopic pregnancy had occurred in the tube, in not a single instance but one had he removed the second tube, because he believed a woman whose tubes had been much inflamed, where there was an exudate which had not been absorbed, rarely ever became pregnant in that tube. It was a congenital condition.

Dr. W. W. Chipman, of Montreal, said there was a great difference between recovery and cure, and the paper of Dr. Smith had directed attention in a general way to the subject of surgery in following all cases after they left the care of the physician or the hospital. He would like to ask Dr. Smith one question, namely, what he considered to be the etiology of these cases. He thought that we could divide the etiology of these cases into two classes: first, those where the tube had been disabled by inflammatory mischief, and second, where there had been imperfect growth. Development was complete, but the growth of the tube was imperfect. By that he meant that the muscle wall of the tube was thin. The tube retained its convoluted embryonic appearance, but its wall was attenuated; its musculature was poor, and these cases occurred in patients who had had bad hygienic surroundings in youth, badly fed, and poorly housed. In both of his cases this was the condition.

Dr. I. S. Stone, of Washington, D. C., alluded to the possibility of a third ectopic, and said he did not think Dr. Smith referred to the question of a possible tubal abortion. When the speaker first heard of a third ectopic it appeared to him an impossibility, but on sober thought it was not. He had seen one tubal abortion in which the tube was much better preserved when it was very much more funnel-shaped than the ordinary tube in many other cases.

Dr. Smith, in closing the discussion, and in replying to Dr. Fry's suggestion, that a distinction be made between the cases operated on from below and those operated on from above, said that he did not in his paper make this distinction, although the point was a good one. He could have done so, although the statistics would not have been very exact. As a matter of fact, it could not have a very direct bearing upon the procedure, as in the majority of cases of a second recurrence in the same tube, often operations had been undertaken from below. Most of the operations now were done from above, and therefore this distinction would not be as necessary to-day as it was five or ten years ago. He thought in this matter the wishes of the patient should be consulted.

He agreed with what Dr. Polak had said in regard to the social condition of the patient as to previous sterility. He would extend this to patients who had already borne a number of children, and who would run the risk of a second ectopic or keep within the same possibility of a second normal intrauterine pregnancy.

In reply to Dr. Chipman relative to the etiology, he agreed with him perfectly as to the general division into two classes: first, those cases that were dependent upon inflammatory disease; and, second, those in which there was some congenital defect of the tube.

OFFICERS

The following officers were elected for the ensuing year: President, Dr. Howard A. Kelly, Baltimore; First Vice-President, Dr. Richard R. Smith, Grand Rapids, Michigan; Second Vice-President, Dr. John A. Samson, Albany, New York; Secretary, Dr. Leroy Broun, New York, re-elected; Treasurer, Dr. J. Wesley Bovee, re-elected.

Baltimore, Maryland, was selected as the place for holding the next annual meeting.

WASHINGTON SURGICAL SOCIETY

The First Regular Meeting Was Held in the George Washington Medical School on March 17, 1911, at 8 p. m., with the President, Dr. Vaughan, in the Chair

CLINICAL REPORTS

Dr. Fowler presented a case of *exstrophy of the bladder* which had been operated on several times, by various surgeons. Complete epispadias still remained although the condition had been considerably improved in that the bladder was

nearly covered in. The ureteral orifices were visible and the man wore a rubber urinal continuously.

DR. VAUGHAN said the trouble with most operations for exstrophy was that no sphincter could be made and that a urinal had to be worn. Peters' operation was perhaps the best yet devised for the palliation of these cases.

DR. CARR reported a case of *phlegmonous erysipelas and gangrene of the scrotum*, slough and plastic operation. The case was in a white man, age 26, who had had gonorrhœa and syphilis. The erysipelas developed three days after a circumcision, which, however, was apparently not the cause of the erysipelas, as the penis was not affected. The infection was probably from scratching. Dr. Carr showed the stages of the lesion and the steps of the operation by charts. The scrotum sloughed off in a week leaving the testicles bare. About that time a bubo formed and was opened, the staphylococcus aureus being the infecting germ. Four doses of vaccine were given; one was of a stock vaccine and three autogenous; in all one thousand million were given. The suppuration then quickly subsided. Flaps from the thighs with the base toward the saphenous opening to give best blood supply were dissected up and sutured in the median line. There was primary union without complication of any kind.

DR. FOWLER reported a similar case of gangrene of the scrotum in a case suffering with retention of urine. In this case the testicles were bare and the urethra was gangrenous from two inches behind the meatus to the triangular ligament. A perineal section was done with difficulty and the wound granulated until the testicles were half covered. The urethra was re-formed by using a skin flap as floor and a remnant of mucous membrane of the urethra as a roof and the testicles were covered later. At present a No. 26 sound can be passed and urination is practically normal.

DR. HAGNER said that no part of the body stood plastic work better than the perineum and reported a similar case which granulated over without any plastic work at all with an excellent result. As long as a little mucous membrane is left a passage can be kept open and a channel made. Dr. Miller asked Dr. Carr as to the staphylococcus causing erysipelas. Dr. Carr said he used the word erysipelas in the clinical sense in which it was used before germs were known. In looking up the subject he had found that the experience of others was that the scrotum rapidly re-forms after such an operation. The testicles were rarely involved, being protected by the tunica albuginea and having a blood supply different from the rest of the scrotum.

DR. VAUGHAN then read the paper of the evening entitled "A Case of Transplantation of the Knee Joint," which appears in this issue of SURGERY, GYNECOLOGY AND OBSTETRICS.

DR. ERVING said in discussion that the tendency of the bone to regenerate was hopeful, and mentioned Lexer's work which seemed to point to such a possibility.

DR. MITCHELL said it was unfortunate that Dr. Vaughan's case was such a bad subject. If the joint had been aseptic a perfect union might have resulted. It was a remarkable case considering all the difficulties.

DR. BORDEN said that a differentiation must be made between "transplantation" and "regeneration." Transplantation would mean the absolute replacement of one tissue by another and its survival as such. In the cited case the joint used served as a bridge for regeneration. If both tissues were alive the difficulty would be great, but in this case the best that could be hoped for was that by placing a bridge which resembled the original the new bone would assume the shape of the old. He scarcely thought it possible that each tissue should live as such.

DR. MAGRUDER said that Dr. Borden had touched on an important point. He had met Lexer, who is uncertain whether he had secured a transplantation or a restoration.

DR. CARR said the difficulties in such a case were shown in the failure of detached fragments in fractures to live under what would seem to be favorable conditions. Everything seems to depend upon a periosteal blood supply even though small. He explained the formation of new bone in similar shapes by the action of osteoclasts and osteoblasts and stated the advantage of using a bridge of a desired shape rather than bone chips or other substance. Dr. Snyder asked if it might not be better to use some other suture material than metal which he thought might cause atrophy and necrosis.

DR. VAUGHAN, in closing, said that metallic sutures were used almost universally without bad result. He thought that actual union of tissues might result and give a genuine transplantation. Lexer had apparently secured such a result in a case which was inspected at a subsequent operation. Recent work seems to show that other transplanted tissues than bone may live and functionate, and it seems reasonable to hope that bony union may be secured in such cases as the one reported.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF GYNECOLOGY

UNDER THE CHARGE OF

J. CLARENCE WEBSTER, M. D.
J. C. HOLLISTER, M. D.
HELIODOR SCHILLER, M. D.
E. C. DUDLEY, M. D.
GEO. DE TARNOWSKY, M. D.
CAREY CULBERTSON, M. D.

The Influence of Ether and Ether Anæsthesia on Bacteriolysis, Agglutination and Phagocytosis. EVARTS A. GRAHAM. *The Journal of Infectious Diseases*, 1911, vol. 8, p. 147.

Graham undertook this study as a part of a more general problem on postoperative lung complications. An attempt was made to investigate the effect of ether on the phenomena of bacteriolysis, agglutination, and phagocytosis.

Because of the ease with which marked fluctuations of the bactericidal and agglutinating powers of a serum may be determined with the use of the typhoid bacillus, the work to be described concerning the effect of ether on bacteriolysis and agglutination was carried out with this organism. In each case experiments were carried out *in vitro* by adding ether in varying amounts to both normal and immune typhoid serums and also *in vivo* by observing the effect of ether anæsthesia on these properties of the serums of practically normal human individuals, normal rabbits, and rabbits which were immune to the typhoid bacillus. The experiments on bacteriolysis were conducted in the usual manner by counting the number of colonies on agar plates after incubating the mixtures of serum and bacteria for variable periods. In none of the work was there observed any appreciable effect of the drug on bacteriolysis. The observations of the effect of the drug on agglutinations were made with both the macroscopic and microscopic methods. Here also no alteration of the phenomenon was produced when ether was present in any amount from 0.1 to 2 per cent, or after an ordinary ether anæsthesia.

In the work on phagocytosis it was found that ether, when added to both normal human and rabbit serum *in vitro* in varying amounts of from 1 per cent to 2.5 per cent, reduces markedly the phagocytosis of streptococci. Similarly a reduction of phagocytosis was observed to occur after an ordinary ether anæsthesia both in the human and rabbit.

The reduction *in vivo* was demonstrated with streptococcus, pneumococcus, staphylococcus aureus, B. coli and B. typhosus. For the study of the effects of the anæsthesia on human individuals, cases were taken which involved fairly simple operative procedures on comparatively healthy young adults. Precautions were taken to rule out factors which might complicate the results, such as infection, hæmorrhage, shock, etc. The experiments on normal rabbits were carried out by subjecting them only to an ether anæsthesia without any operative measures of any kind. In this work the usual opsonic technique was employed. The reduction of the phagocytic power of blood after an ordinary ether anæsthesia continued in different experiments over periods of two days' to several weeks' duration. The depression apparently was due to a direct effect of the ether on both leucocytes and serum, not to any effect on the bacteria themselves. The effect on the leucocytes was determined (1) by noting a greater decrease in the phagocytosis when the patient's leucocytes were used in the experiments than when normal leucocytes were employed, and (2) by observing on a warm stage a diminished amount of ameboid motion and less phagocytosis of carmine particles by leucocytes subjected to the action of ether. Streptococci were added to both the normal serum and the mixture containing ether, and after thirty minutes' incubation the bacteria were washed free from the serum by centrifuging in three changes of 0.85 sodium chloride solution. They were then added to normal leucocytes. Much greater phagocytosis occurred when normal serum had been used for sensitizing than when the serum and ether mixture had been employed.

In seeking for an explanation of these phenomena the hypotheses of Meyer and Overton, that the anæsthetic action of the fat solvent drugs depends on their affinity for the fatlike substances of the body, seemed to the author to afford a possible explanation of the mechanism by which ether reduces the phagocytic power of the blood.

Accordingly experiments were conducted to determine whether or not the fat solvent power of the ether is the property by means of which it is capable of inhibiting phagocytosis. The problem was attacked by noting (1) the effect *in vitro* of the addition of a fat to blood, the phagocytic power of which had been reduced by an ad-

mixture of ether; (2) the effect *in vitro* of the addition to normal blood of ether previously saturated with a fat; and (3) the effect *in vivo* of injecting a fat into an animal subjected to an ether anæsthesia. At first lecithin was used because it is a fatlike substance which is almost universally present in the body. It was found that when lecithin was added in small amounts to the blood which had been subjected to the action of ether, a prompt restoration of phagocytosis occurred. When ether was previously saturated with lecithin and then added to normal blood no diminution of phagocytosis was evident. Finally, when 0.1 gm. of lecithin was injected subcutaneously into etherized rabbits the phagocytic power of the animals' blood was restored to its preanæsthetic condition in a few hours, whereas control rabbits which received a similar amount of physiologic salt solution showed a depression of phagocytosis which extended over a period of many hours. Graham, believing that these results were not necessarily specific for lecithin, and that they might be obtained by the use of other ether soluble substances, employed olive oil, a fat of widely different nature. Similar results were obtained, but it was found that in general more of the olive oil was required to produce the effect. Moreover, it was observed that the injection of suitable amounts of the oil into the rectum was followed after three to six hours by a restoration of phagocytic powers, while, on the contrary, the injection of the same amount of physiologic salt solution had no appreciable effect in shortening the period of phagocytic depression. In the human experiments 5 ounces of warm olive oil were passed slowly into the rectum through a tube immediately after the patient had returned from the operating room. GEORGE BEILBY.

The Ovary in Cases of Anomaly of the Constitution (Über die weibliche Keimdrüse bei Anomalie der Konstitution). DR. BARTEL AND DR. HERRMANN. *Monatsch. f. Geb. u. Gyn.*, b. xxxiii, h. 2.

During extensive research work into the condition of the so-called "status lymphaticus and status thymico lymphaticus," the attention of the authors was drawn to the ovary on account of typical anomalies present there. Macroscopically in all cases the size and peculiar shape of the ovary was very apparent; in 58 per cent the ovaries were distinctly enlarged, measuring 8½ cm. in length as compared with 4 cm., the size of the normal ovary. As to the shape, there were two varieties present; the very long and narrow form, similar to the infantile ovary, and the excessively large ovary, retaining the form of the normal ovary. An ovary twice the size of the normal is no rarity.

One other very peculiar condition was present in 68 per cent of the 119 cases which were examined. The surface of the ovary was found perfectly smooth, and even in ovaries of women over 40, no scar nor unevenness could be detected. The cortex seemed much thickened and subcortically there was a great number of cysts of different sizes. Histologically it was evident that the enlargement was caused by hyperplasia of the connective tissue, and this was particularly true in the cortex. The corticular substance was poor in nuclei, it was fibrous and scarlike, while the medullary substance showed more cells and was richer in nuclei. The primordial follicles were normal in size and shape, but their number apparently decreased, the walls of the vessels showed often hyaline degeneration, and some were completely obliterated. The ripening of the primordial follicles to the mature follicle seemed to be disturbed by the fibrous condition of the cortex, their wall did not rupture; therefore the large number of cysts which were nothing but ruptured Graafian follicles. Finally in these dilated follicles the contents were absorbed and a "corpus fibrosum" resulted.

In the history of the 119 cases, there were recorded 13 amenorrhœas and 19 anomalies of menstruation.

Both authors came to the conclusion that the typical anomalies of the size and shape of the ovary, of the hyperplasia of the connective tissue, the large number of cysts, the disturbance of the maturing of the follicles, and the smooth surface of the ovary, form a distinct part characteristic of the complex called "status lymphaticus or thymico lymphaticus." They refute the opinion of Pfannenstiel, who considers the described condition of the ovary as a chronic oöphoritis, and believe that we have to deal with a pre-existing anomaly.

HELIODOR SCHILLER.

The Pathology and Clinical Manifestations of Malignant Chorioepithelioma (Zur pathologie und Klinik des malignen Chorioepithelioma). F. HITSCHMANN AND ROBERT CRISTOFOLETTI. *Wien. klin. Wchnschr.*, 1911, xxiv, 655, 705.

After a study of the literature and several cases the writers come to the following conclusions: (1) There are no known anatomical differences between benign and malignant forms of chorioepithelioma. (2) There is no distinction clinically, since some cases with metastases can heal spontaneously and on the other hand those cases clinically apparently harmless have proven to be malignant. (3) In determining whether a chorioepithelioma is present or not together with the microscopic findings clinical examination is of great importance. One must use great caution in interpreting the microscopic findings. (4) From the anatomical structure of the tumor the danger of metastasis through extension in the maternal circulation is very great. Every procedure can cause emboli. The stormy, extremely malignant course of many cases after the operation is to be carried back to an artificial overwhelming position which is always present, the course of the cases after operation is altogether various. This is due at least in part, to the fact that the disease of the parametric and spermatic veins, so frequently involved, is of an essential and changing influence on the extension of the tumor. If the extension of the

malignant chorioepithelioma is confined to the great pelvic veins this forms the basis of a thrombosis and leads to spontaneous and durable retrogression. (5) We must strive in the treatment to prevent artificial metastasis. If a suspicion of chorioepithelioma is present all unnecessary interference must be avoided and any operative procedure be undertaken with caution and judgment. This holds good especially for curettage. In the radical operation in every case the abdominal route is to be used in order to carry out as extensive a dissection of the hypogastric and spermatic veins together with the total extirpation of the uterus. (6) The indication for operation is as broad as possible.

C. G. GRULEE.

The Treatment of Extrauterine Pregnancy (Zur Behandlung der extrauterinen Schwangerschaft). HJALMAR FORSSNER. *Nord. Med. Arkiv.*, 1911, Afd. 1 (Kirurgi), Festshrift for J. Berg, Nr. 34.

This report is based on a total of 160 cases between the years of 1890 and 1909, operated upon in the Gynæcologic Clinic in the Krankenhaus Sabbatsberg. At the same institution there were 34 non-operative cases during this time. Of the operated cases ten died while among the non-operated there was no mortality. At Gynæcologic Clinic of the Serafim Lazarette between the years 1892 and 1909 there were 164 operative cases with two deaths and 36 non-operative and no deaths. In the Swedish Hospital in 1904 and 1908 there were 434 cases with 16 deaths; of these 388 were operated with a mortality of 3.9 per cent. The writer takes up the subject from the standpoint of the literature dividing the subject into two parts — that with free hæmorrhage in the peritoneal cavity, and that with the formation of hematocele. He comes to the following conclusions: The most important point in the treatment of extrauterine pregnancy is immediate operation even though the patient be in shock. The early operation gives the best results as well in regard to life as to the later possibility of conception. In only a small percentage of the cases of hematocele can one obtain good results by the expectant method of treatment. In this condition also operative procedure favors possibility of conception.

C. G. GRULEE.

Some Points in the Diagnosis and Treatment of Cancer of the Breast (78 Cases). HUGH MALLINSON RIGBY. *The Practitioner*, 1911, lxxxvi, 348.

The operation performed by Rigby is very extensive; all the glands and subcutaneous tissue in the region are removed. After the operation he has given a course of X-ray treatment, six applications seeming to be sufficient.

Of sixteen private patients, six were operated upon within a year and are not included in the table, of the other ten one died recently, one eighteen months after operation, and one could not be traced. This leaves seven, of which one is alive six years after operation, one four years, eight months; one, three years and six months; one, three years and five months; one, one year and three months, and two, one year and eight months. Of these seven cases and the six recently operated on none show any tendency to recurrence. The hospital cases give the following records:

Fifty-six cases operated on at the London Hospital:

(a) 19 alive and well for a period from 7 years to 6 months; no recurrences.

(b) 3 alive but with recurrences; average duration, 4 years after operation.

(c) 8 alive when last seen without recurrence; present condition impossible to obtain.

(d) 3 alive when last seen but with recurrence, now probably dead.

(e) 10 patients cannot be traced.

(f) 12 patients known to be dead; average duration of survival after operation, 15 months.

(g) 1 died from other causes; no recurrence 5 years after operation.

Six cases operated on at Poplar Hospital:

(a) 1 alive and well, period 5½ years. 1 alive and well 1 year, 7 months.

(b) 2 cannot be traced.

(c) 2 dead.

C. G. GRULEE.

Malakoplakia Vesicæ Urinariæ (Über Malakoplakia Vesicæ Urinariæ). G. HEDREN. *Nord. Med. Arkiv.*, 1911, afd. 1 (Kirurgi), Festshrift for J. Berg, Nr. 3.

The author's case was a woman 45 years old who died of chronic parenchymatous nephritis. The mucous membrane of the bladder was filled with cherry-sized protuberances which were distributed over all the bladder except the trigonum, which contained very few. Urethra had none. Hedren has collected twenty-one cases from the literature and discusses the condition in detail. In regard to the etiology he says that an inflammatory process is present, which has progressed under the character of a hyperplasia of the fixed and mobile connective tissue cells and a simultaneous blood-vessel formation. He regards this inflammation as not the result of tubercle bacillus infection but rather from the bacterium coli commune.

C. G. GRULEE.

Drainage of the Abdominal Cavity with Dreesmann's Glass Drain (Zur Drainage der Bauchhohle mit Dreesmannschen Glasdrains). DR. RUDOLPH RUBESCH. *Wien. klin. Wchnschr.*, 1911, xxiv, 421.

This is a report of a case in which the Dreesmann's perforated glass drain was inserted after the operation. A portion of the intestine formed a sort of Littre's hernia through one of the perforations of the tube. The accident was discovered at autopsy.

C. G. GRULEE.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF OBSTETRICS

UNDER THE CHARGE OF

C. S. BACON, M. D.
HELIODOR SCHILLER, M. D.
HERBERT MARION STOWE, M. D.
C. G. GRULEE, M. D.

Bacteriological Blood Examinations in Cases of Puerperal Sepsis (Bacteriologische Blutuntersuchungen bei Puerperalfieber). DR. SEMON. *Monats. f. Geb. u. Gyn.*, b. xxxiii, h. 2.

These examinations were made first to find a probable relationship between the bacterial findings and the courses and final outcome of the case, and also in order to determine how often in puerperal fever microbes are present in the blood. The blood of 86 cases was examined, the first examination being made if possible inside the first 24 hours after the onset of the fever. In all cases the bacteriological findings in the lochia and in the blood were exactly recorded. Among these 86 cases, microbes were found in 12 cases. Six of the cases died and 6 recovered.

Among the six fatal cases were four with streptococci in the blood. In the rest the hæmolytic staphylococcus albus was found in the blood as well as in the lochia. In the first of these two latter cases staphylocci were found only once in the blood and only in small number. In the four cases of streptococcæmia hæmolytic cocci were found. The author never found anhæmolytic streptococci in the blood. All other conditions being equal, the number of colonies in the plates must be exactly counted as their larger or smaller number has a prognostic significance.

In one fatal case of streptococcæmia, the first 24 hours, 58 pro 1 cc. the fourth day 182 colonies were found. The author does not believe this increase to be accidental, but thinks that with the decrease of the defending powers of the body the microbes grow and multiply more actively. He leaves open the question whether it is a real increase in number or an increased absorption of microbes from the primary focus.

Another fatal case showed the first 24 hours 1.6 colonies, the fourth day 4 colonies, and the day before death 150 colonies.

Among the 6 recovered cases 4 had streptococci and 2 staphylocci in the blood. This finding disproves the opinion of many that recovery in case of puerperal sepsis with positive blood cultures has never been observed. While a streptococcæmia or staphylococcæmia will always be a bad prognostic symptom, it cannot be called a death sentence. The first case of the two with staphyloccocus in the blood showed an anhæmolytic staphylococcus albus. Pro 1 cc. 273 colonies were found. The blood cultures were positive only one day. The author does not believe, as many other authors do, that in cases of bacterio-hæmia of such short duration the microbes were mechanically pressed into the circulation, as during operative interference. The case mentioned was a spontaneous miscarriage. The four recovered cases of streptococcæmia showed the microbes in the blood during the first 24, seldom 48, hours after onset of the fever. In all four cases the number of colonies was small. An exact determination of the degree of the virulence of the bacteria by different methods has failed. In all cases there was a complete parallelism between the bacteria of the blood and lochia. Among the 74 cases with a negative blood finding, four died. As the cause of death in these cases, a high toxæmia or anæmia, through the operation, must be supposed. At any rate the assumption that every puerperal infection will heal spontaneously if there are no microbes in the blood, is incorrect.

HELIODOR SCHILLER.

Decapsulation of the Kidneys in Eclampsia (Nierendekapsulation bei Eklampsie). K. BAISCH. *Monatschrift für Geburtshilfe und Gynäkologie*, b. xxxii, h. 6.

Judging from the reports of various operators and the results obtained under the same form of treatment as after rapid delivery, it is apparent that the severity of eclampsia varies considerably. Only in this manner can one explain the maternal mortality of Bumm (2.5 per cent) as compared with that of Zweifel (6.5 per cent) and Doederlein (25 per cent). Much depends upon the nutrition and the habits of life of the patient and the condition of the kidneys at the time of delivery. Rapid delivery does not constitute the only method of treatment, as a certain number of women die even after labor. About 50 per cent have convulsions in the puerperium. Over 36 per cent of these patients die. Twenty per cent die of those cases where the convulsions cease after the birth of the child.

Eclampsia is more of a general disease and the toxins act on other vital organs of the body. If

the kidneys are so injured that they are unable to excrete the toxins, the prognosis is more grave. In the attempt to stimulate the excretion of toxins after delivery, abstraction of blood is excellent, as we are able to remove a certain amount of toxic material directly from the body. The free ingestion of lemonade, weak tea, and sugar water, tends to thin the poisonous fluids while sweating, and the use of diuretics, such as digitalis and caffeine, are valuable adjuncts.

When in the succeeding hours after delivery, oliguria and anuria appear, drastic diuretics are called for and the most powerful of these is decapsulation of the kidneys. This fact is proven by numerous experimental and clinical observations. Sippel showed that 81 per cent of all cases of decapsulation were followed by a marked increase in urinary excretion. In the 19 per cent where this did not occur, the kidneys showed such degenerative changes that any therapy would be valueless. The assertion of Edebohls that the stripping of the kidney capsule caused a new formation of blood-vessels between the organ and its surroundings does not always hold true, when it does occur, the improvement takes place a long time before such a formation could develop. The theory of excessive tension of the capsule is likewise untenable, for in many cases the organs are small and pale and yet decapsulation leads to improvement and recovery. In fact, the majority of reported cases show the kidney to be small and pale and the capsule not distended.

Baisch states that in the 50 per cent of women who suffer from post delivery convulsions, those who fail to react from diuretics are proper subjects for decapsulation. It is necessary, however, to define the indications for the operation sharply. Doederlein advises a rapid delivery by the vaginal Cæsarean section if the condition of the cervix is unfavorable for other methods, and this operation finds here its chosen field. It is also important to determine whether the other vital organs are mortally injured; such findings contraindicate the procedure. Many women die from severe changes in the liver, heart, and brain that have been operated upon by decapsulation and the death has been attributed to the operation. For example, the author lost one woman from multiple liver necroses and a diffuse hematogenous icterus. It is possible to determine such unfavorable conditions during life. Liver degeneration and icterus may be suspected by biliary pigment in the urine and cranial lesions by certain clinical signs and symptoms. In one patient, Baisch deferred operation because of a pronounced icterus and in another because of facial paralysis. In the latter case, autopsy disclosed a cerebral hæmorrhage in the neighborhood of the fourth ventricle.

In general, it is better to operate too often than too infrequently, as the operation itself will not decrease the patient's chances for recovery. Only one case is on record where the patient died from the immediate effects of decapsulation. The mortality of puerperal eclampsia is 36 per cent. Collected statistics show that 65 per cent of this number may be saved by decapsulation. In other words, decapsulation will reduce the mortality of post delivery eclampsia from 36 to 13 per cent.

HERBERT M. STOWE.

Kidney Decapsulation in Eclampsia (Nierendekapsulation bei Eklampsie). DR. RUPERT FRANZ. *Wien. klin. Wchnschr.*, 1911, xxiv, 447.

Franz reports one successful case. He thinks that the indications should be as follows:

1. Following delivery.
2. The existence of oliguria or anuria or increasing albuminuria.
3. The existence of convulsions or of coma.

C. G. GRULEE.

A Case of Vesicular Mole with Vaginal Metastasis (A proposito di un aso di Mola Vesiculare con Metastasi Vaginale). DR. E. OPOCHER. *Folia Gynecologica*, vol. iv, 1911.

Case. Patient, 36. Previous history of five miscarriages and five normal pregnancies. Puerperium always normal. Previous history negative as regards illnesses. Amenorrhœa for 3½ months without any disturbances. Was taken suddenly with profuse hæmorrhages accompanied by sacrolumbar pains.

On examination, the uterus reached above the pubis, cervix closed, Hegar's sign absent, mammary secretions positive. Urinalysis negative, except for presence of indican. Placed on expectant treatment, the hæmorrhage ceased, to reappear again a week later. On second examination a pedunculated tumor was found, the size of a small nut, violet colored, soft, having its pedicle attached to the right lateral wall of the vagina near the vulva.

The tumor was excised and abortion induced. Patient spontaneously expelled an ovum undergoing vesicular degeneration, weighing 250 grams. Several hours later a mass of coagulated blood and vesicular moles was also expelled. Curettage also removed many vesicular moles. Patient recovered normally, but one month later the hæmorrhage reappeared, lasting a few days. Her present condition is normal. The macroscopical and microscopical examination of the uterine masses revealed the typical findings of vesicular mole. The vaginal node contained in its center small amounts of syncytial tissue with a preponderance of elements of Langhans' layer.

GEORGE DE TARNOWSKY.

BOOK REVIEWS

A System of Ophthalmic Operations. Being a Complete Treatise on the Operative Conduct of Ocular Diseases and Some Extraocular Conditions Causing Eye Symptoms. Edited and partly written by Casey A. Wood, M.D., C.M., D.C.L. Cloth. Price, $15.00. Pp. 1,824, with more than 1,000 original drawings and colored illustrations. Complete Index. Volumes I and II. Chicago: Cleveland Press, 1911.

This is one of the great books of the year, and it may be said that not since the four-volume work of Norris and Oliver appeared, has such an important contribution been made to ophthalmology. There are numerous smaller books that deal with this subject, some, of course, better than others, and, naturally, every general book on ophthalmology discusses surgery in a more or less satisfactory manner; but until this work of Dr. Casey Wood was published no book in the English language was in that respect, wholly satisfactory; indeed, it may be said without fear of contradiction, that the volumes under consideration are the most complete of their kind to be found in any language, and that they give utterance to the last and complete word on ophthalmic surgery that will be spoken for at least a decade.

It is highly probable that no additional publication on this important subject will be necessary for many years, as the books not only delve into ancient forms of ophthalmic operations, instruments, etc., but bring these subjects down to the most modern methods—to the very month of "going to press."

The work is a veritable encyclopedia of the topics it undertakes to expound, and it can be safely said that there is nothing in ophthalmic literature, ancient or modern, of importance relating to eye surgery, that will not be found recorded. It takes up every phase of each surgical procedure and describes it from beginning to end, in plain English. Such descriptions, supplemented by the best and most profuse original illustrations we have ever seen in any book upon a surgical topic, form clinical media that are almost, if not quite, as satisfying as demonstrations by the best operators. The reader is carried along step by step through each phase of the operation, almost all the important steps being demonstrated by illuminating diagrams.

The editor and his co-workers must, therefore, be congratulated on having made this an American undertaking, and to have shown the medical world that the ophthalmologists of this country are capable of producing the best work of its kind. This is not said in disparagement of our European brethren, but simply because we are glad that such an epoch-making treatise has been written and illustrated by Americans. While it would have been interesting to have had the entire work from the pen of the Editor himself, we are nevertheless of the opinion that the volumes are better as a composite work, giving the varied experiences of many of the best men in this country, most of whom have an international reputation.

While the contents of the System have flowed from multiple sources, those who are familiar with Dr. Wood's manner of work can unmistakably see his editorial care, method, and accuracy on every page. The uniform arrangement, the complete footnotes, the elaborate references, the concise and comprehensive legends, the carefully prepared index, etc., we will venture to say, have all been supervised and corrected by him.

The chapters on "Remedies, Appliances and Procedures in Minor Ophthalmic Surgery," "Operations on the Orbital Walls," "Operations for Senile Cataract," and "Operations on the Retina" are all written by Dr. Wood and deal with the subjects in his usual scholarly and practical manner. An important and interesting chapter is contributed by Dr. Mortimer Frank on "Biographical Sketches of Some Representative Ophthalmic Surgeons"; another by Thomas Hall Shastid, on "The Forensic Relations of Ophthalmic Surgery." These chapters are useful and comprehensive, and demonstrate in themselves the character and scope of the production.

These books should not only be on the shelves of every progressive ophthalmologist, but should be in the hands of all modern surgeons who are called upon to perform ophthalmic operations. To such men the chapters on "Anæsthesia" by Wendell Reber, "Operations for Enucleation," etc., by Frank Allport, "Operations on the Orbital Walls," by Casey Wood, "Operations on the Nose and Its Accessory Sinuses," etc., by Frank Brawley, and "Operations on Distant Organs" by A. E. Halstead, especially the last named, will, we are sure, be of distinct value to the general surgeon.

This treatise is too large and comprehensive to permit of a more detailed review, but it can be safely said that it is most creditable to the Editor, to his collaborators, to the publishers, and to the illustrator, and should have a large sale among surgeons everywhere.

The System is dedicated to the late Herman Knapp of New York.

CLINICAL CONGRESS OF SURGEONS OF NORTH AMERICA

ALBERT J. OCHSNER, M. D., President
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Second Annual Meeting, Philadelphia, November 7 to 16, 1911

PHILADELPHIA COMMITTEE ON ARRANGEMENTS

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BARTON COOKE HIRST, M. D.
JOHN B. ROBERTS, M. D.

THE PHILADELPHIA MEETING

WITH the Philadelphia meeting four months in the future the programs for both the clinical and literary sessions are now fairly complete. A perusal of the following pages will give one a very accurate idea of the scientific treat that has been prepared by the Philadelphia clinicians for the members of the Clinical Congress of Surgeons of North America.

The list of clinicians numbers over two hundred and more than a score of the hospitals and schools are coöperating. The capacity of the amphitheatres and operating rooms is such that nearly two thousand visitors may be cared for comfortably on any day.

The importance of Philadelphia as a medical center assures a plentiful supply of clinical material, making possible a wide range of operative procedures.

The scope of the clinics has been so enlarged as to include every branch of surgery and in the list of operators one will find the names of the leading men of Philadelphia in all branches of medical science. Several special demonstrations have been arranged to cover various phases of hospital work, which will add materially to the interest of the meeting; such as surgical pathology, surgical technique of the hospital, vaccine therapy, cystoscopy, œsophagoscopy, bronchoscopy, Bier's hyperæmia, rapid Rœntgengology, stereo-radiography, etc.

Negotiations are in progress at this time with the various railway traffic associations with regard to special rates for this meeting. In certain sections of the United States and Canada low rates have already been granted, and in an early issue a complete announcement will be made as to rates, special trains, through service, etc.

Letters received by the General Secretary from members in all parts of the continent indicate the unusual interest manifest in this meeting, and we may safely predict at this time that the Philadelphia meeting will be successful to the highest degree in point of scientific interest and attendance.

THE CLINICAL PROGRAM

PRELIMINARY OUTLINE OF THE CLINICS, WHICH WILL BE REVISED EACH MONTH UNTIL COMPLETE

PHILADELPHIA GENERAL HOSPITAL

WILMER KRUSEN	Obstetrical clinic; November 7, 11 to 1 P. M.
H. M. CHRISTIAN	Genito-urinary clinic; November 7, 2 to 4 P. M.
WALTER ROBERTS	Laryngological clinic; November 7, 4 to 6 P. M.
H. A. WILSON	Orthopedic clinic; November 8 and 10, 9 to 11 A. M.
JOSEPH W. HEARN	Surgical clinic; November 8 and 15, 11 to 1 P. M.
E. H. SITER	Genito-urinary clinic; November 8, 2 to 4 P. M.
GEORGE E. DE SCHWEINITZ	Eye clinic; November 8 and 15, 4 to 6 P. M.
J. B. CARNETT	Surgical clinic; November 9, 9 to 11 A. M.
W. J. ROE	Oral surgery clinic; November 9 and 16, 11 to 1 P. M.
M. B. HARTZELL	Dermatological clinic; November 9, 2 to 4 P. M.
ERNEST LAPLACE	Surgical clinic; November 9, 4 to 6 P. M.
GEORGE P. MULLER	Surgical clinic; November 10, 9 to 11 A. M.
FRANK D. DICKSON	Orthopedic clinic; November 10, 11 to 1 P. M.
E. P. DAVIS	Gynecological and Obstetrical clinic; November 10, 2 to 4 P. M.
J. C. KNIPE	Eye clinic; November 10, 4 to 6 P. M.
HENRY TUCKER	Genito-urinary clinic; November 11, 9 to 11 A. M.
L. W. STEINBACH	Surgical clinic; November 11, 11 to 1 P. M.
M. P. WARMUTH	Surgical clinic; November 11, 2 to 4 P. M.
W. M. SWEET	Eye clinic; November 11, 4 to 6 P. M.
WILLIAM L. RODMAN	Surgical clinic; November 13, 9 to 11 A. M.
M. H. CRYER	Oral surgery clinic; November 13, 11 to 1 P. M.
M. B. MILLER	Surgical clinic; November 13, 2 to 4 P. M.
B. M. ANSPACH	Gynecological clinic; November 13, 4 to 6 P. M.
T. T. THOMAS	Surgical clinic; November 14, 9 to 11 A. M.
ELLA B. EVERITT	Obstetrical clinic; November 14, 11 to 1 P. M.
H. R. LOUX	Surgical clinic; November 14, 2 to 4 P. M.
ALEXANDER UHLE	Genito-urinary clinic; November 14, 4 to 6 P. M.
GEORGE M. BOYD	Obstetrical clinic; November 15, 9 to 11 A. M.
R. C. NORRIS	Obstetrical clinic; November 15, 2 to 4 P. M.
H. K. GASKILL	Dermatological clinic; November 16, 2 to 4 P. M.
HERSHEY THOMAS	Surgical clinic; November 16, 4 to 6 P. M.

PENNSYLVANIA HOSPITAL

W. E. LEE	Surgical technique of the hospital. Surgery of the peritoneum; acute, localized, and diffuse inflammations; tubercular peritonitis. Cystoscopic examinations. Fractures and dislocations. Nov. 7, 13 and 15, 10 A. M.; Nov. 13, 3 to 4 P. M.
ROBERT G. LE CONTE	Tubercular glands of the neck; goiter. Surgery of the female perineum. Acute inflammations of bone. Nov. 7, 11 to 1; Nov. 11, 12 to 1; Nov. 16, 11:30 to 1.
DRS. PACKARD and COATES	Surgery of the ear, nose and throat. Nov. 7, 2 to 4.
FRANCIS A. PACKARD	Surgical diseases of the ear. Nov. 15, 2 to 4.
W. T. LONGCOPE	Surgical pathology. Nov. 8, 10 A. M.
JOHN H. GIBBON	Hernia; inguinal, femoral, umbilical. Malignant diseases; tumors of the breast. Surgery of the kidney, ureter and bladder. Nov. 8, 11 to 1; Nov. 13, 11:30 to 1; Nov. 15, 11 to 1.
DRS. SCHWENK and SHOEMAKER	Surgery of the eye. Nov. 8 and 13, 2 P. M.
DRS. ALLEN and ASHHURST	Fractures and dislocations. Nov. 9 and 10, 10 A. M.
EDWARD B. HODGE	Traumatic surgery of the lung. Club foot and tendon transplantation. Nov. 9, 11:30 to 1; Nov. 16, 10 to 11:30.
FRANCIS T. STEWART	Surgery of the heart and pericardium; thoracic aneurysm. Surgery of blood-vessels. Nov. 9, 2 to 4; Nov. 14, 11:30 to 1.
ARTHUR E. BILLINGS	Surgery of the female pelvis. Nov. 10, 11:30 to 1.
DRS. EVES and SCARLET	Surgery of the ear, nose and throat. Nov. 10, 2 to 4.
CHARLES F. MITCHELL	Surgery of the intestine; typhoid perforations. Surgery of the upper abdomen. Nov. 11 and 14, 10 A. M.
CHARLES N. DAVIS	Surgical diseases of the skin. Nov. 14, 2 to 4.

POLYCLINIC HOSPITAL

B. F. Baer	Gynecological clinic. Nov. 7 and 14, 2 P. M.
L. H. Adler	Rectal clinic. Nov. 7, 1 P. M.; 13, 2 P. M.
J. M. Baldy	Pelvic inflammatory disease. Uterine displacements and fibroid tumors. Nov. 9 and 16, 10 A. M.
John B. Roberts	Surgical clinic. Demonstration of plastic operations on cadaver (laboratory). Plastic surgery of the face, exhibiting operations and results. Nov. 9 and 16, 11 A. M.
J. B. Roberts and L. W. Steinbach	Surgical clinic. Nov. 11, 11 A. M.
F. R. Packard	Nose and throat clinic. Operations on the accessary sinuses. Demonstration in tracheobronchoscopy. Nov. 8 and 15, 3 P. M.
G. M. Dorrance and N. Ginsberg	Demonstration of transfusion methods (laboratory). Nov. 10, 10 A. M.
G. M. Dorrance	Demonstrations in operative gynecology (laboratory). Nov. 10, 3 P. M.; Nov. 16, 1 P. M.
R. Butler	Demonstration in operative surgery of the ear and mastoid (laboratory). Nov. 8 and 15, 4 P. M.
W. Reber	Ophthalmological clinic. Nov. 8, 1 P. M.
E. L. Vansant	Nose and throat clinic. Submucous operations for deviation of the nasal septum. Nov. 8 and 15, 12 M.
J. A. Kelly	Demonstration in surgical pathology. Nov. 9, 1 P. M.; Nov. 13, 12 M.
J. F. Schamberg	Dermatological clinic. Exhibition of cases of lupus and skin cancer treated by X-ray and other methods. Treatment of angiomata and other nævi by solid carbon dioxide. Nov. 7 and 11, 12 M.
A. Hewson	Demonstration in regional and surgical anatomy. Nov. 7, 3 P. M.; Nov. 14, 12 M.
L. W. Steinbach	Surgical clinic. Surgery of the thyroid gland. Nov. 7 and 14, 11 A. M.
J. H. Jopson and J. Speese	Surgical clinic. Treatment of pulmonary tuberculosis by nitrogen injections. Nov. 8, 11 A. M.
J. H. Jopson	Surgical clinic. Nov. 15, 11 A. M.
C. L. Leonard	Demonstration in X-ray laboratory. Rapid stereoroentgenology. Nov. 7, 4 P. M.; Nov. 11, 1 P. M.; Nov. 14, 3 P. M.
A. A. Sargent	Demonstration in refraction. Nov. 7 and 14, 10 A. M.
W. Roberts	Aural clinic. Nov. 8 and 15, 2 P. M.; Nov. 13, 1 P. M.
William R. Nicholson	Gynecological clinic. Cystoscopy and ureteral catheterization. Nov. 8, 11 and 15, 10 A. M.
M. B. Miller	Surgical clinic. Hernia. Demonstration in operative surgery. Methods of intestinal anastomosis (laboratory). Nov. 10 and 13, 11 A. M.
J. K. Young	Orthopedic clinic. Diagnosis and treatment of infectious arthritis. Tendon transplantation for infantile paralysis; Lange's operation. Nov. 9 and 16, 2 P. M.
A. W. Watson	Nose and throat clinic. Nov. 9 and 16, 3 P. M.
W. M. Sweet	Ophthalmological clinic. Ocular injuries by foreign bodies. Nov. 10, 1 P. M.
W. M. Sweet and C. R. Heed	Demonstration in operative ophthalmology (laboratory). Nov. 11 and 15, 1 and 4 P. M.
J. P. Tunis	Demonstration in operative surgery of throat and nose (laboratory). Nov. 11, 3 P. M.; Nov. 16, 4 P. M.
B. A. Thomas	Genitourinary clinic. Chromoureteroscopy, demonstrating carmine test. Intravenous use of salvarsan. Functional kidney diagnosis by the Duboscq colorimeter. The Wasserman technique. Nov. 10 and 14, 4 P. M.
W. C. Posey	Ophthalmological clinic. Nov. 9, 4 P. M.
M. B. Miller, R. M. Goepp and J. A. Kelly	Arteritis obliterans. Exhibition of patients and specimens. Nov. 10, 12 M.
J. Thorington	Refraction. Nov. 10, 2 P. M.
G. M. Coates	Aural clinic. Nov. 11, 2 P. M.
J. S. Gibb	Nose and throat clinic. Tonsillectomy by modern methods. Nov. 13, 3 P. M.
G. H. Makuen	Faulty operations on the tonsils, and their effect on the soft palate and the voice. Nov. 13, 4 P. M.
T. Erck	Gynecological clinic. Nov. 14, 1 P. M.

HOSPITAL OF THE UNIVERSITY OF PENNSYLVANIA

C. H. Frazier	Clinical demonstrations. Laboratory demonstrations.
Edward Martin	Open treatment of fractures. Urinary calculi. Vasa-epididymostomy.
B. A. Thomas	Results of cases treated, and a demonstration of dessication by the monopolar high frequency current of surface growths and hollow viscera neoplasmata, benign and malignant.
G. G. Davis	Treatment of tuberculous disease of hip and spine; congenital luxation of hip; paralysis from anterior poliomyelitis; operations for ankylosed and flail joints.
T. T. Thomas	Shoulder injuries, two new operations.
John B. Deaver	Operations on the appendix, stomach and gall passages.
George Fetterholf	Clinical anatomy of thorax.
E. H. Siter	Genitourinary technique.
A. A. Uhle	Renal insufficiency.
W. H. Mackinne	Urethroscope.
John L. Laird	Cystoscope and catheterizing ureters.
Alfred C. Wood and E. E. Eliason	Instruments: (*a*) Demonstration of a tourniquet for the control of hæmorrhage from the scalp during operations on the skull or brain. (*b*) Osteoplastic resection of the skull by means of an instrument operated by hand. Technique: A method of exposing the spinal laminæ.
J. B. Carnett	Hernia: with operations, inguinal, femoral, and umbilical. Typhoid perforation and treatment.
C. C. Norris	Treatment of sterility and dysmenorrhœa by means of a new form of stem pessary. Review of all cases of latter condition. Gonorrhœa in women.
Barton Cooke Hirst	Technique of hysterectomy for various indications; vaginal and abdominal hysterectomies; operative treatment of obstructed labors and placenta prævia; repair of the genital canal.
W. R. Nicholson	Methods of intrauterine bacteriological examination.
R. Tait McKenzie	Treatment of flat foot, round shoulders, lateral curvature, or hernia, by exercise.
H. K. Pancoast	Stereoscopic work.
George E. de Schweinitz and J. T. Carpenter	Surgery of the eye.
T. B. Halloway, Carl Williams and H. Maxwell Langdon	Demonstration of special methods of diagnosis.
J. E. Sweet and Edward Martin	Open treatment of fractures. Arterial suture. Vascular anastomosis.
George P. Muller	Demonstration of patients operated upon for various joint lesions: tuberculous arthritis, ankylosis, rheumatoid arthritis, etc. Demonstration of certain malpositions and anomalies of the gastrointestinal tract with special reference to ptosis. Effect of salt solution, introduced intravenously, upon hæmolysis. Demonstrations in surgical pathology.
C. P. Grayson	Demonstration of correction of deflections of the nasal septum, with local, followed by general anæsthesia. Tonsillectomy versus tonsillotomy. The intranasal surgery of the accessary sinuses.
B. A. Randall and Ralph Butler	Radical tympanomastoid exenteration for middle ear caries. Surgical anatomy of the temporal bone. (Demonstration with specimens and lantern.) Diagnostic tests in otologic practice. The best every day treatment of chronic catarrhal and suppurative ear disease.
Brooke M. Anspach	Perineal operations with adaptation of subcuticular suture.
Floyd E. Keene	Diagnosis of renal tuberculosis.
John G. Clark	Surgical phases of enteroptosis and other current clinical material.

JEWISH HOSPITAL

W. H. Teller, E. L. Klopp, L. W. Steinbach and Dr. Stern	Surgical clinics.
E. L. Klopp and S. M. Smith	Otological clinics.
A. W. Watson	Laryngological clinics.
W. G. Elmer	Orthopedic clinics.
Isaac Leopold and J. C. Knipe	Ophthalmological clinics.

CHILDREN'S HOSPITAL

H. R. WHARTON	Surgical clinic. Nov. 7.
F. R. PACKARD	Nose and throat clinic. Nov. 8.
B. A. RANDALL	Ear clinic. Nov. 9.
J. H. JOPSON	Surgical clinic. Nov. 10.
W. C. POSEY	Eye clinic. Nov. 11.
E. B. HODGE	Surgical clinic. Nov. 13.
F. K. KNOWLES	Surgical skin affections. Nov. 14.
J. A. BABBITT	Nose and throat clinic. Nov. 15.
C. Y. WHITE	Surgical pathology. Nov. 16.

PRESBYTERIAN HOSPITAL

GEORGE STRAWBRIDGE	Surgery of the eye. Nov. 7, 2 to 4 P. M.
W. S. NEWCOMET	X-ray therapeutics. Nov. 7, 2 to 4 P. M.
JOHN H. GIRVIN	Gynecological clinic. Nov. 8, 2 to 4 P. M.
H. R. WHARTON	Surgical clinic. Nov. 9, 2 to 4 P. M.
GEORGE ERETY SHOEMAKER	Gynecological clinic. Nov. 10, 2 to 4 P. M.
D. B. PFEIFFER	Surgical pathology. Nov. 10, 2 to 4 P. M.
E. B. HODGE	Surgical clinic. Nov. 11, 2 to 4 P. M.
JOHN H. JOPSON	Surgical clinic. Nov. 13, 2 to 4 P. M.
GEORGE C. STOUT and A. H. CLEVELAND	Ear, nose and throat clinic (surgical). Nov. 14, 2 to 4 P. M.
FRANK C. KNOWLES	Surgical diseases of the skin. Nov. 14, 2 to 4 P. M.
WILLIAM D. RODMAN	Surgical clinic. Nov. 15, 2 to 4 P. M.
RICHARD F. WOODS	Gynecological clinic. Nov. 15, 2 to 4 P. M.

METHODIST EPISCOPAL HOSPITAL

J. B. ROBERTS	Surgical clinic. Nov. 7, 12 to 2; Nov. 14, 11 to 2.
JOSEPH SPELLISY	Surgical clinic. Nov. 9 and 16, 11 to 12 A. M.
J. T. RUGH	Orthopedic clinic. Nov. 8, 10 and 13, 11 to 12 A. M.
WALTER ROBERTS	Otological and laryngological clinic. Nov. 9 to 16, 1 to 4 P. M.
L. T. HAMMOND	Surgical clinic. Nov. 8, 10 and 13, 12 to 2 P. M.
J. P. MOORE	Ophthalmological clinic. Nov. 9 and 16, 4 P. M.
R. C. NORRIS	Gynecological clinic. Nov. 14, 2 P. M.
L. A. SALADE	Gynecological clinic. Nov. 13, 2 P. M.

ST. JOSEPH'S HOSPITAL

J. M. SPELLISY	Surgical clinic, Nov. 7, 9, and 14; 1 P. M,
M. M. FRANKLIN	Surgical clinic, Nov. 7, 9, and 14; 9 A. M.
C. F. NASSAU	Surgical clinic, Nov. 7, 9 and 14; 3 P. M,
E. E. MONTGOMERY	Gynecological clinic, Nov. 7, 10 and 14, 11 A. M.
P. B. BLAND and F. H. MAIER	Gynecological clinic, Nov. 8, 9, 11, 13, 15 and 16; 11 A. M.
S. L. ZIEGLER and P. J. PONTIUS	Ophthalmological clinic, Nov. 8, 10 and 15, 4 P. M.
DR. JONES	Ophthalmological clinic, Nov. 9, 11, 14 and 16, 4 P. M.
G. M. MARSHALL	Ear, nose and throat clinic, Nov. 7, 8, 11, 14 and 15, 9 A. M.
DR. SENDERS	X-ray clinic. Daily at noon.

HOWARD HOSPITAL

BARTON COOKE HIRST	Gynecological clinic; Nov. 7 and 14.
ALFRED C. WOOD	Surgical clinic; Nov. 10, 12:30 P. M.
W. C. POSEY	Ophthalmological operations; Nov. 13, 2 P. M.
GEORGE B. WOOD	Tonsillectomy; accessory sinus disease; straightening of crooked nasal septum; mastoid operation, etc.; Nov. 9 and 16, 2 P. M.

WILLS EYE HOSPITAL

P. J. PONTIUS, M. RADCLIFFE, S. L. ZIEGLER, C. BERENS, S. D. RISLEY, F. FISHER, W. C. POSEY, P. N. K. SCHWENK and W. ZENTMAYER	Operative clinics daily; 2 to 3 P. M.

JEFFERSON HOSPITAL

Orville Horwitz and Hiram R. Loux	Genitourinary clinic; alternate days; 1 to 2 P. M.
W. F. Hansel and William M. Sweet	Eye clinic; Nov. 8, 9 and 10; 2:30 to 4 P. M.
J. Chalmers Da Costa and Charles F. Nassau	Surgical clinic; Nov. 8, 10, 13, and 15; 1 P. M.
John H. Gibbon	Surgical clinic; Nov. 7, 11, and 14; 1 to 3 P. M.
H. Augustus Wilson	Orthopedic clinic; Nov. 7, 9, 11, 14, and 16; 10 to 11 A. M.
E. E. Montgomery and J. M. Fisher	Gynecological clinic; daily; 9 to 11 A. M.
S. McCuen Smith	Otological clinic; Nov. 8, 10, 13, and 15; 1 to 2 P. M.
Edward P. Davis	Obstetrical clinic; daily; 4 to 5 P. M.
D. Braden Kyle	Laryngological clinic; Nov. 7, 9, 11, 14 and 16; 1 P. M.
Willis F. Manges	X-ray clinic; daily; 1 to 2 P. M.

SAMARITAN HOSPITAL

Wilmer Krusen	Gynecological clinic. Nov. 8, 11 and 15; 12 M.
Guthrie McConnell	Demonstration of the surgical pathology of malignant tumors. Nov. 8, 2 P. M.
Collier Martin	Rectal clinic. Demonstration of results obtained in the treatment of fistula in ano. Nov. 8 and 15, 3 P. M.
W. Wayne Babcock	Surgical clinic with demonstration of segment anæsthesia by intradural injection. Demonstration of plastic or reconstructive surgery. Nov. 8 and 15, 4 P. M.; Nov. 11, 3 P. M.
Harry G. Duncan	Demonstration of cystoscopy and ureteral catheterization. Nov. 9, 1 P. M.
Nathan G. Ward	Use of high frequency currents and static wave current in the treatment of diseases of nose and throat. Nov. 9, 2 P. M.
Harry Hudson	Orthopedic clinic. Nov. 9, 4 P. M.
William H. Hitschler	Ear, nose and throat clinic. Demonstration of excision of the facial and pharyngeal tonsils. Nov. 10, 3 to 4; Nov. 13, 2:30 P. M.
William E. Robertson	Surgical errors in the diagnosis of intra-abdominal disease. Nov. 10, 4 P. M.
A. Parker Hitchens	Preparation of bacterial vaccines. Application of bacterial vaccines and allied products in surgical therapeutics. Nov. 10, 5 P. M.; Nov. 15, 2 P. M.
C. E. de M. Sajous	The rôle of the ductless glands in relation to surgical therapeutics, Nov. 11, 2 P. M.
William A. Steel	Genitourinary clinic, Nov. 13, 4 P. M.
J. F. Schamberg	Stereopticon demonstration of syphilis with special reference to the newer therapy. Nov. 13, 5 P. M.
Wendel Reber	Ophthalmic operative clinic. Nov. 14, 3 P. M.

KENSINGTON HOSPITAL

H. C. Deaver	Gynecological clinic; November 9 and 13, 2 to 5 P. M.

MEDICO-CHIRURGICAL HOSPITAL

Ernest Laplace	Surgical clinic; Nov. 7 and 11; 11 to 1 P. M.; Nov. 13 and 15; 9 to 11 A. M
H. M. Christian	Genitourinary clinic; Nov. 8 and 15; 11 A. M. to 1 P. M.
W. L. Rodman	Surgical clinic; Nov. 8, 10, 14 and 16; 9 to 11 A. M.
J. P. Mann	Orthopedic clinic; Nov. 9 and 14; 11 to 12 A. M.
W. E. Ashton	Gynecological clinic; Nov. 9 and 14; 12:30 to 2 P. M.
L. W. Fox	Eye clinic; Nov. 10 and 13; 1 to 3 P. M.
E. B. Gleason	Otological clinic; Nov. 10 and 15; 3 to 4 P. M.
S. C. Burns	Oral surgical clinic; Nov. 11; 9 to 10 A. M.
G. M. Boyd	Obstetrical clinic; Nov. 13; 12 to 1 P. M.
A. H. Cleveland	Nose and throat clinic; Nov. 16; 12 to 2 P. M.

HAHNEMANN HOSPITAL

Surgical Clinics — Nov. 8 and 15, 2:30 to 5.

W. B. Van Lennep	Prostatectomy; hernia.
H. L. Northrop	Goiter; appendix.
G. A. Van Lennep	Stomach and gall-bladder.
H. P. Leopold	Open treatment of fractures.
W. N. Hammond	Club foot; tendon transplantation.
J. D. Elliott	Breast tumors.
C. A. Bigler, Jr.	Hæmorrhoids; fistula; other current clinical material.

Gynecological and Obstetrical Clinics — Nov. 11, 2:30 to 5; Nov. 16, 10:30 to 1.

D. B. James	Pelvic inflammatory disease; fibroids.
N. F. Lane	Uterine displacements.
J. E. James, Jr.	Obstetrical demonstration; repair of genital canal.

Eye, Ear, Nose and Throat Clinics — Nov. 8, 11 and 15, 2:30 to 5.

W. W. Speakman	Operations on the eye.
F. W. Smith and Oscar Seeley	Demonstration of tracheo-bronchoscopy and œsophagoscopy.
I. G. Shallcross and H. S. Weaver	Surgery of the accessory sinuses; nose and throat clinic.
G. J. Palen	Radical mastoid operation.

CHILDREN'S HOMEOPATHIC HOSPITAL

H. S. Weaver, F. W. Smith and Oscar Seeley	Ear, nose and throat clinics; Nov. 9 and 16, 2:30 to 5.
L. W. Thompson	Surgical clinic; Nov. 9 and 16, 2:30 to 5.

ST. LUKE'S HOMEOPATHIC HOSPITAL

D. Roman	Goiter; Nov. 11 and 14, 2:30 to 5.

WOMAN'S HOSPITAL OF PHILADELPHIA

Sarah H. Lockrey	Gynecological clinic; November 7 and 16, 10 A. M.
Emma E. Musson	Yankauer's Eustachian Tube work; November 7, 2 P. M. Bronchoscopic and Esophageal Tube work; November 14, 2 P. M.
Caroline M. Purnell	Gynecological clinic; November 8 and 15, 10 A. M.
Miriam Butt	Eye clinic; November 8 and 15, 2 P. M.
Kate W. Baldwin	Surgical clinic; November 9, 10 A. M. Beeswax in Bone Cavities and in Cavities of the Soft Tissues; November 11, 2 P. M.
Mary W. Griscom	Obstetrical clinic; November 9, 1 P. M.
Marie K. Formad	Panhysterectomy; November 10, 10 A. M. Gynecological clinic; November 14, 10 A. M.
Margaret F. Butler	Submucous Resection; November 10, 2 P. M. Removal of Tonsils and Adenoids; November 13, 2 P. M.
Catharine Macfarlane	Cystoscopy and Bier's Hyperemia; November 11, 10 A. M.
Frances R. Sprague	Surgical clinic; November 13, 10 A. M.
Mary Getty	Eye clinic; November 16, 2 P. M.

HOSPITAL OF THE WOMAN'S MEDICAL COLLEGE

Ella B. Everitt	Gynecological clinic. Nov. 7, 9, 14 and 16, 1 P. M.
Margaret F. Butler	Laryngological and rhinological clinic. Nov. 8 and 15, 2 P. M.
Harry C. Deaver	Surgical clinic. Nov. 10, 1 P. M.
Emma E. Musson	Aural clinic. Nov. 13, 2 P. M.

GERMAN HOSPITAL

JOHN B. DEAVER	Surgical clinic every other day.

GYNECEAN HOSPITAL

J. M. BALDY	Supravaginal hysterectomy with anchorage of the cervix to the round ligaments in connection with plastic operations for uterine prolapse. Suspension of the uterus by posterior attachment of the round ligaments. Hysterectomy for carcinoma of the cervix. Hysterectomy for fibroid tumor of the uterus. Nov. 8 and 13, 10 A. M.
HENRY D. BEYEA	Suspension of the stomach for gastroptosis by plication of the gastrohepatic omentum. Supravaginal resection of the uterus for fibroid tumor, with conservation of a part of the endometrial cavity and the ovaries. Nov. 9, 10 A. M.
THEODORE ERCK	Suspension of the kidney. Hysterectomy for pelvic inflammatory disease. Nov. 10, 10 A, M.
BROOKE M. ANSPACH . . .	Cystoscopic examination and catheterization of the ureters. Vesicovaginal interplacement of the uterus for cystocele and prolapse. Resection of excessive fat from the abdominal wall in connection with operation for ventral hernia. Nov. 11, 10 A. M.
GEORGE W. OUTERBRIDGE .	Demonstration of interesting gynecological specimens. Nov. 14, 10 A. M. Demonstration of specimens removed at each operation and other specimens bearing on cases of the day, daily.

EPISCOPAL HOSPITAL

H. C. DEAVER	Surgery of the female pelvis. Nov. 7, 2 to 4 P. M.
LOUIS MUTSCHLER	Surgery of hernia. Nov. 8, 2 to 4 P. M.
T. R. NEILSON	Surgery of the urinary tract. Nov. 9, 2 to 4 P. M.
G. ORAM RING	Surgical diseases of the eye. Nov. 10, 2 to 4 P. M.
CHARLES H. FRAZIER . .	Surgery of the stomach and duodenum. Nov. 11, 2 to 4 P. M.
C. Y. WHITE	Vaccine therapy. Nov. 13, 2 to 4 P. M.
C. C. BIEDERT	Surgical diseases of the ear, nose and throat. Nov. 14, 2 to 4 P. M.
A. P. C. ASHHURST . . .	End results of fracture of the femur. Nov. 15, 2 to 4 P. M.
J. L. BROMLEY	Surgical diseases of the eye. Nov. 16, 2 to 4 P. M.

ORTHOPEDIC HOSPITAL

WILLIAM J. TAYLOR . . .	Cases of operation for brain tumors; cerebellar cyst. Discussion of laminectomy for Pott's disease; operation for exophthalmic goiter.
GWILYM G. DAVIS	Tendon transplantation; cases of arthroplasty, arthrodosis; cases illustrative of treatment of club-foot, tuberculous disease of joints, etc.

PHILADELPHIA LYING-IN CHARITY HOSPITAL

G. M. BOYD	Obstetrical clinic; Nov. 10, 12 to 1.
STRICKER COLES	Obstetrical clinic; Nov. 14, 12 to 1.

EVENING LITERARY SESSIONS

IN LATER ISSUES THE NAMES OF SPEAKERS AND OTHER INFORMATION WILL BE ADDED AS THE WORK OF THE COMMITTEE PROGRESSES

Wednesday, November 8th

PHILADELPHIA COUNTY MEDICAL SOCIETY — In Mitchell Hall, College of Physicians, at 8:15 P.M.

SURGERY OF THE UPPER ABDOMEN

1. Surgical Pathology of the Stomach and Duodenum J. F. BINNIE, M. D., Kansas City, Missouri.
   Discussion opened by W. L. RODMAN, M. D., Philadelphia.
2. Surgery of the Liver and Bile Ducts . . . GEORGE EMERSON BREWER, M. D., New York City.
   Discussion opened by ROBERT G. LECONTE, M. D., Philadelphia.
3. Surgery of the Pancreas . . . . . MAURICE H. RICHARDSON, M. D., Boston.
   Discussion to be opened by JOHN B. DEAVER, M. D., Philadelphia.

Thursday, November 9th

PRESIDENTIAL MEETING — In the Ball Room of the Bellevue-Stratford, at 8:15 P. M.

President's Address: Co-ordination of Undergraduate and Postgraduate Teaching of Clinical Surgery . . . . . ALBERT J. OCHSNER, M. D., Chicago.

The Technique and Remote Results of Blood-vessel Anastomoses (Lantern Demonstration) . . . . . ALEXIS CARREL, M. D., New York City.

Cancer of the Stomach; Its Surgical Cure (Lantern Demonstration) . . . . . WILLIAM J. MAYO, M. D., Rochester, Minn.

Friday, November 10th

PHILADELPHIA NEUROLOGICAL SOCIETY — In Mitchell Hall, College of Physicians, at 8:15 P. M.

The Technique and Results of Deep Injections of Alcohol for Ticdouloureux . . . . . HUGH T. PATRICK, M. D., Chicago.
Discussion to be opened by F. X. DERCUM, M. D., Philadelphia.

Surgery of the Pituitary Body . . . . . HARVEY CUSHING, M. D., Baltimore.

Operative Treatment of Experimental Lesion of the Spinal Cord Equivalent to the Crush Injury of Fracture Dislocation of the Spinal Column . . ALFRED REGINALD ALLEN, M. D., Philadelphia.
Discussion to be opened by CHARLES H. FRAZIER, M. D., Philadelphia.

Monday, November 13th

PHILADELPHIA ACADEMY OF SURGERY — In Mitchell Hall, College of Physicians, at 8:15 P. M.

Some Observations on the Thyroid Gland and Its Diseases, CHARLES H. MAYO, M. D., Rochester, Minn.
Discussion to be opened by FRANCIS J. SHEPHERD, M. D., Montreal, Quebec.

The Operative Treatment of Fractures . . . . . JOSEPH A. BLAKE, M. D., New York City.
Discussion to be opened by EDWARD MARTIN, M. D., Philadelphia.

The Significance of Blood in the Stools . . . . . J. M. T. FINNEY, M. D., Baltimore.
Discussion to be opened by MAURICE H. RICHARDSON, M. D., Boston, Mass.

Tuesday, November 14th

PEDIATRIC SOCIETY OF PHILADELPHIA — In Mitchell Hall, College of Physicians, at 8:15 P. M.

THE SURGERY OF CHILDHOOD

1. Pyloric Stenosis in Infancy, its Surgical Treatment (Lantern demonstration) . . . . . CHARLES L. SCUDDER, M. D., Boston.
2. Some Differences between the Surgery of Children and Adults . . . . . CHARLES N. DOWD, M. D., New York City.
3. A Paper on Orthopedic Surgery. . . . . R. TUNSTALL TAYLOR, M. D., Baltimore.

Wednesday, November 15th

OBSTETRICAL SOCIETY OF PHILADELPHIA — In Mitchell Hall, College of Physicians, at 8:15 P. M.

Surgery of the Tubes and Ovaries . . . . . EDWARD REYNOLDS, M. D., Boston.
The Treatment of Ectopic Gestation . . . . . EDWARD B. CRAGIN, M. D., New York City.
The Circulation of Fibroid Tumors (Lantern Demonstration) JOHN A. SAMPSON, M. D., Albany, N. Y.

COMBINED MEETING OF THE SECTIONS ON OTOLOGY, LARYNGOLOGY AND OPHTHALMOLOGY
In Thompson Hall, College of Physicians, at 8:15 P. M.

The Surgery of the Sinuses and Its Relation to Orbital Complications . . . . . JOSEPH H. BRYAN, M. D., Washington, D. C.
The Relation between Otitic and Intracranical Diseases . GORHAM BACON, M. D., New York City.
The Newer Operations for Glaucoma . . . . . JOHN E. WEEKS, M. D., New York City.

PHILADELPHIA HOTELS AND THEIR RATES PER DAY

HOTELS A, American; E, European.	One Person		Two Persons	
	Without Bath	With Bath	Without Bath	With Bath
BELLEVUE-STRATFORD, Broad and Walnut Sts... E	$2.50 up	$3.50 up	$3.50 up	$ 4.50 up
RITTENHOUSE, 22nd and Chestnut Sts..... E	1.50 "	2.00 "	2.50 "	3.00 "
RITTENHOUSE, 22nd and Chestnut Sts..... A	4.00 "	4.50 "	7.50 "	8.00 "
ST. JAMES, 13th and Walnut Sts..... E	2.00 "	2.50 "	3.00 "	3.50 "
WALTON, Broad and Locust Sts..... E	2.00 "	3.00 "	3.00 "	4.00 "
ALDINE, 1914 Chestnut St..... E	2.50-5.00	3.00-5.00	3.50- 6.00	4.00- 6.00
ALDINE, 1914 Chestnut St..... A	4.00-6.00	5.00-6.00	8.00-10.00	10.00-12.00
CONTINENTAL, 9th and Chestnut Sts..... E	1.50 up	2.00 up	2.50 up	3.00 up
NEW BINGHAM, 11th and Market Sts..... E	1.50 "	2.50 "	3.00 "	4.00 "
COLONNADE, 15th and Chestnut Sts..... E	1.50 "	2.00 "	2.50 "	4.00 "
LORRAINE, Broad St. and Fairmount Ave..... E	1.25 "	1.50 "	2.50 "	3.00 "
LORRAINE, Broad St. and Fairmount Ave..... A	3.50 "	.....	.....	.....
RODMAN, 800 North Broad St ..... E	.....	1.50 "	.....	3.00 "
NORMANDIE, Chestnut and 36th Sts..... A	3.50 "	4.00 "	6.50 "	7.50 "
GREEN'S, 8th and Chestnut Sts..... E	1.00-1.50	2.00 "	1.50-2.00	3.00 "
STENTON, Broad and Spruce Sts..... E	1.50 up	2.50 "	2.50 up	4.00 "
MAJESTIC, Broad St., above Girard..... E	2.00 "	2.50 "	3.00 "	4.00 "
HANOVER, 12th and Arch Sts..... E	1.00 "	1.50 "	2.00 "	2.50 "

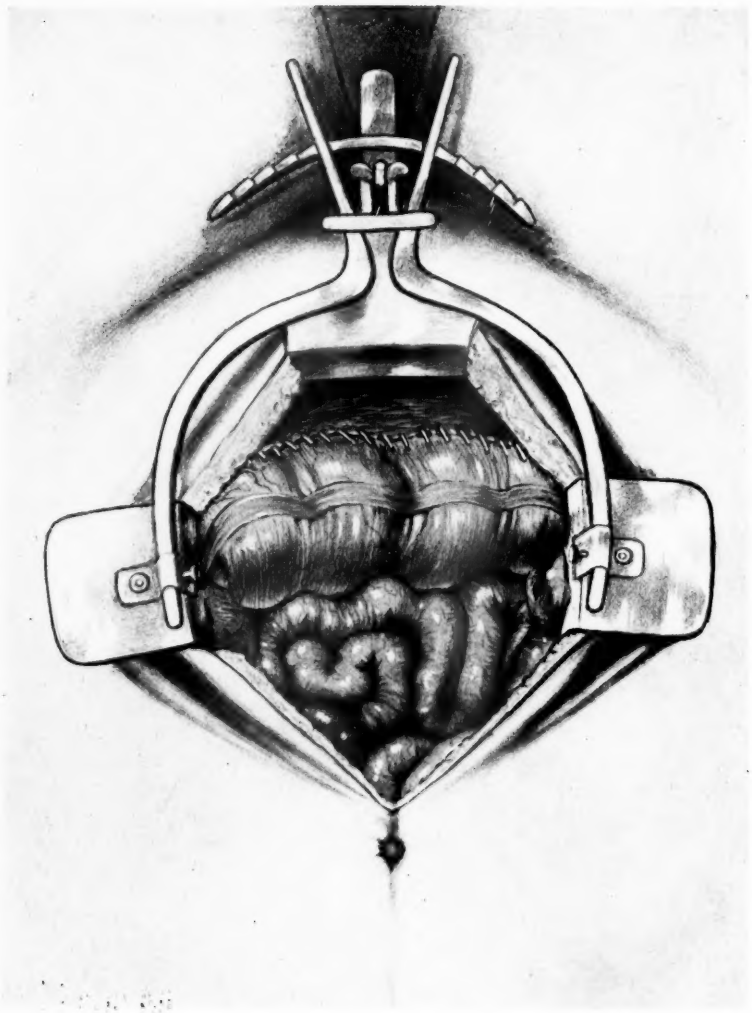

Plate A. The sigmoid flexure sutured to the bladder and lateral pelvic walls so as to cover over all ragged and infected areas after a subtotal removal of the uterus and infected tubes and ovaries.